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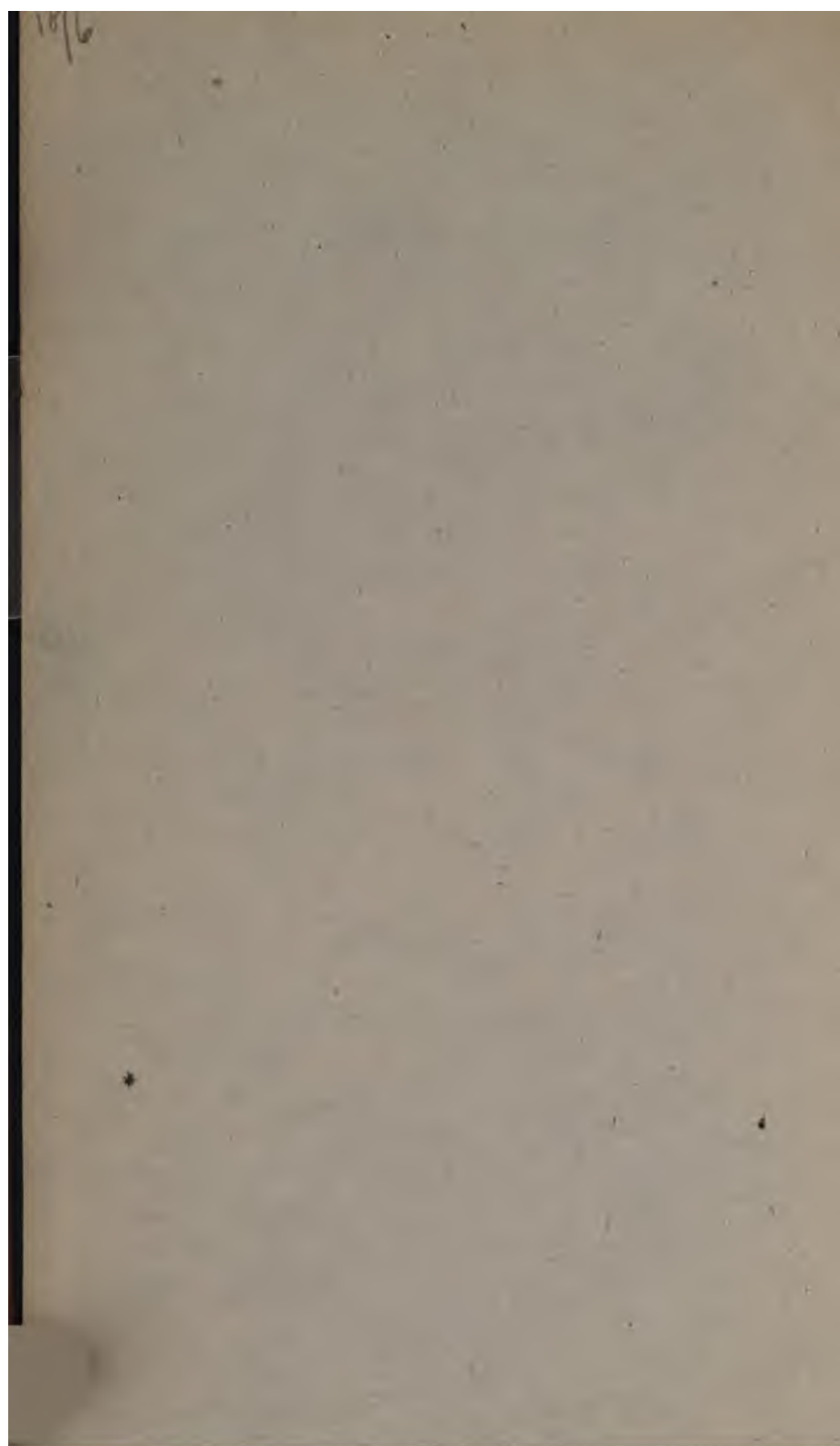
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HIP DISEASE IN CHILDHOOD.

FIG. 1.



Section through the upper end of a healthy femur of a boy age 8 years. The position and extent of the two epiphyses are seen; also the thinness of the compact bone at upper part of the under surface of the shaft, the projection of which has given it the name of the "calcar femoris." The section has not traversed the ligamentum teres, hence its insertion into the bone is not seen. The difference of texture between this healthy bone and that seen in subsequent figures, as well as the relation of the articular cartilage to the epiphysis and diaphysis and the angle of the neck, are points worthy of note.

FIG. 2.



Surface view of the head of a femur, showing the effects of subchondral ulceration. Patches of thinned and depressed cartilage simulating superficial ulcers are seen. In places the cartilage is perforated. The synovial membrane is somewhat thickened. From the same specimen as Fig. 33. The disease spread from the shaft to the joint.

FIG. 3.



Section showing the whole epiphysis carious; part of it is gone; the articular cartilage is nearly all destroyed, but the marginal part is left intact. The trochanter was peeled off in this case; its position would be on the right of the figure. Shaft healthy. Emma T., case 7.

FIG. 4.



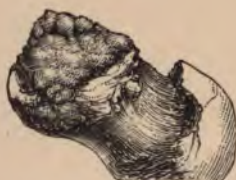
Upper end of femur bisected and the halves turned apart. Shows epiphysitis and extension of mischief below the epiphysal line. There is partial destruction of the epiphysis, and necrosis of cartilage. The periosteum, on the under surface of the neck (seen on the left side of the figure), is stripping off. Annie W., case 20. The acetabulum was bare.

FIG. 5.



The section shows osteomyelitis of the whole epiphysis, and thinning and loosening of the articular cartilage by subchondral caries. The trochanter is seen on the left of the figure. Alfred D., case 1.

FIG. 6.



Surface view. A mass of granulations is seen covering the carious remains of the epiphysis. Portions of the marginal cartilage are still left. William M., case 36. Acetabulum necrosed and perforated.

HIP DISEASE IN CHILDHOOD,

WITH SPECIAL REFERENCE TO

ITS TREATMENT BY EXCISION.

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BY

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PREFACE.

THE greater part of the present work has been already published in America, in the *Archives of Pædiatrics*; and most of the cases in Appendix I., with some of those in Appendix II., have appeared in the annual numbers of Abstracts, edited by the staff of the General Hospital for Sick Children, Manchester. The text has, however, been much revised and expanded from the American issue, into which many mistakes crept from my having no opportunity of correcting proof sheets. The list of excisions has been enlarged, and later records of the condition of many of the cases obtained. That this record is not more complete is due to the practical impossibility of tracing many patients after their discharge from hospital. Most of the cases, however, have been followed up for considerable periods.

I have thought it worth while to publish the work in its present form since hip disease is one of the subjects on which the most directly conflicting views are still held, especially as to the question of excision, and the results of an experience of several hundred cases cannot be without interest. The present uncertainty in the matter is, in my opinion, to no small extent due to the habit of assuming that all joints of the body are affected by disease in the same way, while, in fact, the effects of disease are as different as is the construction of the several joints, and the hip stands much by itself in its pathology. The

subject has been treated mainly with reference to the question of operation.

I have to acknowledge many obligations in collecting my material for the work. My colleagues at the Royal Infirmary and the Children's Hospital have kindly sent me, or allowed me, to use many cases. To several generations of Resident Medical Officers at the Children's Hospital I am indebted for help and note-taking, and to our present senior Resident Officer, Dr. Kershaw, for the photographs from which *Figs.* 43 and 46 were engraved.

To my friend and colleague, Mr. Southam, I am specially indebted for much help and advice in correcting proof sheets.

Of the fifty-three illustrations forty-eight are original, and those representing the pathology of the disease have been selected from my own collection, as showing fairly the different conditions met with. The whole collection is now being placed in the Museum of the Owens College.

The engraver, Mr. Langton, has spent much trouble in getting accurate representations from photographs taken of the preparations and from study, with me, of the specimens themselves.

The series of 100 excisions are, with one exception, consecutive, and are therefore entirely unselected.

Appendix I. consists of short abstracts of the cases in the Table. Appendix II. contains similar reports illustrating various affections of the joint.

G. A. W.

ON HIP DISEASE IN CHILDHOOD.

CHAPTER I.

GENERAL CONSIDERATIONS.

HIP disease, coxalgia or morbus coxæ, in the commonly accepted use of the term, forms a considerable feature in the list of diseases of general hospitals, and is in children's hospitals often the largest contributor to the surgical wards; for, at the Hospital for Sick Children, Manchester, nearly 300 cases were admitted in the thirteen years (1872-84); and in the five years (1881-5), 254 cases were taken in—the number of surgical beds during that time averaging about 30.* In addition to these, many more attended the Out-patient Department, so that I have had probably between 500 and 600 distinct cases in the last six years.

Mr. Bryant† thinks that thirty per cent of the total number of joint diseases are cases of morbus coxæ.

Age.—As to predisposing causes of the disease, the influence of age is the first and most striking point in hip-disease statistics. For instance, in the Manchester Royal Infirmary, where the admission of children under six years is discouraged, of 423 cases of morbus coxæ, 345 were under twenty years, 279 under fifteen years, and 150 under ten years. No evidence is, however, necessary to demonstrate the well-accepted fact that the disease is especially one of

*Numbers of this kind are, however, always uncertain, inasmuch as readmissions count as new cases.

† *Practice of Surgery.*

childhood further than such as may be gathered from the following tables of cases, collected by Mr. Bryant, Professor Sayre,* and myself, respectively.

My own table, collected specially for this purpose, includes 619 cases—418 at one hospital, and 201 at another.

Under 6 years	...	...	...	...	...	40 cases.
From 6 to 10 years	...	...	...	...	...	110 "
„ 10 to 15	„	...	...	...	...	129 "
„ 15 to 20	„	...	...	...	...	66 "
„ 20 to 25	„	...	...	...	...	39 "
„ 25 to 30	„	...	...	...	...	17 "
„ 30 to 35	„	...	...	...	...	9 "
„ 35 to 40	„	...	...	...	...	4 "
„ 40 to 50	„	...	...	...	...	3 "
54	„	...	...	...	...	1 "
						418 cases.
2 years and under	...	...	...	...	...	28 cases.
From 2 to 5 years	...	...	...	...	...	62 "
„ 5 to 10	„	...	...	...	...	81 "
„ 10 to 14	„	...	...	...	...	30 "
						201 cases.

Mr. Bryant gives 360 cases.

Under 4 years	..	...	...	...	...	126 cases.
From 5 to 10 years	...	...	...	...	...	97 "
„ 11 to 20	„	...	...	...	...	86 "
„ 21 to 30	„	...	...	...	...	27 "
„ 31 to 40	„	...	...	...	...	13 "
Above 40	„	...	...	...	...	11 "
						360 cases.

Prof. Sayre gives 365 cases, of which 221 were under fifteen years, and 121 under five years.

Thus, of 1,344 cases, nearly 1,000 occurred under fifteen years, and even this is much within the truth. Mr. Barwell† says he knows of no case of hip disease beginning after twenty-five, and only one after eighteen years, though of many relapses even between thirty and forty. This is, however, an unusual experience, I think; I have met with several cases later than the ages he mentions.

* *Orthopædic Surgery and Diseases of Joints.*

† *Treatise on Diseases of Joints.*

The alleged causes of the great frequency of the disease in childhood are :

1. That in the active period of growth more change is going on, and therefore more instability exists, and consequently a greater liability to disease (Barwell).

2. That children are more liable to falls and injuries, which are such a fertile source of joint and bone lesions.

3. That it is not till after puberty that the process of natural selection has eliminated the weaklings from the stock.

4. That children are less easily than adults made amenable to the prolonged quiescence required to prevent a slight injury from developing into a formidable disease.

5. Tuberculosis is common in childhood.

Sex.—There is, I think, little doubt that hip disease is more common among males than females—though Mr. Bryant thinks the proportion equal.* Of 619 cases I collected, 371 were males. The probable reason of the difference is that boys are more liable to injury and accident than girls; and this is especially so in our large manufacturing towns, where the mothers go out to work, and the girls soon learn to be too staid to run about or play. Possibly, too, the cause suggested by Mr. Barwell as having some influence in the production of hip disease has something to do with it. I speak of phimosis—a condition which, he thinks, by irritation of the lumbar portion of the spinal cord, gives rise to reflected trophic changes in the joint; he, however, describes a corresponding condition in girls—vaginitis, etc. It is difficult to see why the hip should be affected to the exclusion of other joints; yet there is, no doubt, a certain coincidence, if nothing more, between the two. Mr. Barwell collected 100 cases of hip disease, and found eighty-three had phimosis, more or less complete. I examined sixty-three boys, taken at random, suffering from various diseases; among them

* Dr. Clippingdale, *Med. Press and Circ.*, 1882-83, found the disease affected males and females in the proportion of about 3 to 2.

were twelve cases of hip disease; twenty-eight of the sixty-three had no phimosis, though some of them had slight adhesions; seventeen had complete phimosis, and fifteen had the condition less marked; of the twelve hip patients, four had completely, and four partially, developed phimosis, and four were normal. Thus, twenty per cent of the patients had hip disease; of these, about sixty-seven per cent had phimosis, while of the cases in which there was no hip disease, fifty per cent had long prepuces, and the proportion of complete phimosis cases was greater among the hip patients than the others; there is, therefore, a decided balance in favour of Mr. Barwell's view.

Keen, writing in the *Philadelphia Medical Times*, 1881, has recorded a case of spasm of the hip muscles cured by circumcision, an interesting illustration of the question.

The disease is said (Bryant) to be somewhat commoner on the left side than the right. Out of 72 cases, I found disease of the left hip in 42 instances, and of the right in 27 cases, while in three children both hips were affected.

Social Status.—Hip disease is enormously more common among the poorer classes, for obvious reasons: worse hygienic conditions, less care if injured, greater liability to injury, and, in many cases, a worse inherited constitution, are sufficient to account for the excess; for similar reasons, country-bred children are comparatively rarely the subjects of this complaint.

Mortality.—It is very difficult to get any idea of the mortality resulting directly or indirectly from morbus coxæ, mainly because of the duration of the disease. Very few cases die in hospitals, many die of some intercurrent disease, many change their abode and will be returned, perhaps differently, two or three times over, in any statistical statement, and it is exceedingly difficult or impossible to trace a large number of the cases to their termination. The best test is that we so rarely see cases of hip disease cured or still going on in adults; those that have the

disease in childhood seldom seem to live to adult age with the disease continuing, and perhaps still fewer recover completely. The causes of death will be considered later.

The *Report of the London Clinical Society's Committee on Excision of the Hip in Childhood** showed from an analysis of 429 cases—of which 45 were excised, 260 suppurated, but were not excised, and 124 did not suppurate—that 108, or just over one in four, died, and this is probably under the mark, for, if the history of the non-suppurating cases was traced out, I believe a very large proportion would have been found to relapse, and many to die of the disease.

* *Transactions of the Clinical Society*, 1881.

CHAPTER II.

POINTS IN THE ANATOMY OF THE JOINT.

I PROPOSE here only to mention certain peculiarities in the anatomy of the hip which have a direct bearing upon the disease. These points are largely taken from Mr. Morris' able work on the *Anatomy of the Joints*.

The peculiarities I would lay stress upon are :

1. The complete inclusion of the head of the bone in the acetabulum.

2. The fact that the whole upper epiphysis of the femur is within the joint.

3. The direction of the axis of the neck of the bone, by which a force applied to the trochanter will tend to straighten out the angle formed by the neck and shaft, and consequently will be largely expended upon the inner aspect of the neck. This is a fact of great importance, though I have not noticed comments upon it in its relation to disease. This spot is, as will be seen from the figure (*Fig. 1*), the weakest part of the bone, and a very common site for extensive disease is the "calcar femoris," where the neck forms part of the articular surface.

4. The thinness of the fundus of the acetabulum.

5. The junction of the three pelvic bones in the acetabulum, and the existence of a tri-radiate centre of ossification at their point of meeting ; this centre, however, is not developed till puberty.

6. The fact that the main vessels of supply to the bone enter it on the upper surface of the neck.

7. The extensive area enclosed within the capsule, the attachments of which reach beneath the gluteus minimus, and up to the anterior inferior iliac spine.

8. The thinness of the capsule between the ilio-femoral and pectineo-femoral bands in front and behind between

the ischio-femoral band and the intertrochanteric line. Another weak spot lies in front, where the branch of the external circumflex artery passes into the joint.

9. The parts of the capsule on which strain is thrown in the different movements of the joint.

a. The thin inner and posterior part of the capsule is made taut in extreme flexion with abduction; hence the pain in that movement; the pectineo-femoral band is tightened at the same time.

b. The frequent communication of the psoas bursa with the joint through the thin triangular space between the ilio- and pectineo-femoral bands.

10. The ligamentum teres is loosest in flexion and abduction combined.

11. The cartilage capping the head of the femur is by no means all articular in the sense that it forms part of the bearing surface. A considerable zone of cartilage extends around the rest, and is covered more or less perfectly with synovial membrane. Through this zone, which may be called the "marginal cartilage," numerous vessels pass, and in disease these are often large, though in health the supply is less obvious.* The vessels are apparently derived from the synovial membrane, and in some cases, no doubt, inflammation spreads along their channels and reaches the synovial tissue. So far as I know, these facts are not sufficiently, if at all, recognised. The articular cartilage is especially thick round the insertion of the ligamentum teres, to which it is so closely attached that it may be torn away with the ligament in case of dislocation. The ligamentum teres forms as it were a channel through the articular cartilage to the bone, a fact of great importance, since, as will be seen subsequently, disease beginning in the bone may take this course towards the joint cavity.

12. The vascular supply to the joint need not be speci-

*This marginal cartilage often persists after destruction of the articular surface, and remains of it may be seen in *Figs. 6 and 10.*

fied, except to note that it is perhaps doubtful how far the vessels running along the ligamentum teres supply the epiphysis of the femur.*

13. The nerve supply is derived from the anterior crural, obturator, sacral plexus, and accessory obturator sometimes.

14. There are numerous bursæ in the neighbourhood of the joint, disease of which may either cause or simulate mischief in the hip. Eleven of these are described, the most important being those beneath the psoas and gluteus maximus.

15. The normal range of movement of the joint is through 145° — 150° . Flexion is checked by contact of the thigh with the abdomen when the knee is flexed. In one instance, I met with congenital inability to adduct the thigh sufficiently to cross one leg over the other, in two individuals of one family; in another less-marked case, the patient could not tell me whether the condition was congenital or not.

16. Clippingdale (*loc. cit.*) thinks that the obturator internus muscle plays an important part in determining the course of suppuration within the pelvis (*vide infra.*)

* Cf. Hyrtl; Morris, however, describes them as doing so.

CHAPTER III.

ETIOLOGY AND PATHOLOGY.

As to the etiology of hip disease two principal views are taken—the one that the affection is of traumatic origin, and the other that it is due to a “strumous” or “tubercular” tendency in the subject of it. A certain number of cases appear also to be due to cold and wet; in many other instances the disease follows one of the specific fevers. Enquiry, however, does not show such clear evidence of the exanthems as a frequent exciting cause, as is often stated. In 102 cases of hip disease of my own, there were five cases in which measles and six in which scarlet fever could be traced as a cause. It will, however, often be found that if the exanthems occur in a child the subject already of hip disease, the result is disastrous to the joint. In those cases where other joints are affected with synovial disease, or where much thickening exists, the specific fevers, including erysipelas, sometimes appear to cause disintegration of the chronic inflammatory material, and improvement follows. In twelve cases of acute scarlatinal synovitis recorded by my colleague, Dr. Ashby, the hip was affected twice; in one case pus was withdrawn from the joint; both recovered perfectly. These are, of course, a different type of disease altogether, and probably pyæmic; while in the other chronic cases the disease is usually tubercular, sometimes pyæmic.

It is urged in favour of the first view that there is, in the majority of cases, a history of injury, and this is undoubtedly true; but there can be very few children who do not at some time hurt their hips, and yet only a certain proportion get disease of that joint; it is also said that it

is not the unhealthy, but the active, robust children that are always about and getting into danger that meet with these accidents, and this is also true, but is it not a well-recognised fact that one of the so-called "strumous types" is characterised by excessive energy and activity? Do we not see these delicate children just as active as their fellows?

Numerous authorities could be quoted in support of either view; for instance, Prof. Gross describes the disease as tuberculosis of the hip joint, and Dr. Gibney, of New York, from an analysis of 860 cases, concludes that joint diseases in children are nearly always connected with a "strumous tendency." While on the other hand Mr. Warrington Haward, in 1871, collected 130 cases of joint disease, of which he says that only nine were tubercular and seventeen scrofulous; Mr. Bryant and Prof. Sayre both look upon the disease as traumatic.

Albrecht, in 1883,* examined 325 cases of disease of various joints. In one-third "scrofula" existed, in one-sixth there was a history of injury, and in one-half no definite cause could be assigned.

The results of my own observations on this point will be given presently, as my conclusions depend upon the exact pathology of the disease; but I may say here that out of 102 cases of hip disease, I obtained a history of injury in 40 and a family or personal history of tubercle in 31 instances. (*Vide* also the Table of Excisions.)

Seat of the Disease.—The question of the primary lesion in hip disease has been and still is quite as warmly discussed as the etiology. The synovial membrane, cartilages, ligaments, bones, subsynovial tissue, etc., have all had an initial share in the disease assigned to them. Erichsen divides the disease into femoral, acetabular, and arthritic forms, by the latter meaning lesions beginning in any of the ways that occur in other joints. He considers the femoral form to be most common in children, and usually

* Canstatt's *Jahr.*, 1883.

tubercular. Bryant believes the disease to be local, and in children usually an "articular osteitis."

Erichsen, in his work on Surgery, p. 451, vol. ii., edit. viii., describes the post mortem appearances of the hip in a child of eight, who died of pneumonia six weeks after the onset of hip disease. The joint contained pus; the ligamentum teres was softened and coated with lymph; the synovial membrane inflamed; a yellow, dense, hard patch of bone occupying parts of both the epiphysis and diaphysis was found on section of the femur; hard tubercular spots lay in the cancelli; the deep surface of the cartilage was eroded, and the synovial membrane destroyed where it came into contact with the diseased bone. This I take to be a typical example of the common form of hip disease, except that perhaps the tubercles were more than ordinarily abundant and well marked. In another case there was one tubercular focus in the acetabulum, another at the epiphysial line of the femur.

Ford, in 1810,* described it as a "white swelling," beginning in the bone or cartilage and not differing from other joints.

Bonnet,† whose treatise is as interesting and in many ways valuable as it is elaborate, does not discuss very fully this point, but seems to decide from the analogy of other joints that the mischief begins in the synovial membrane.

Brodie‡ describes a synovitis, now sometimes called by his name, or more often perhaps "pulpy" or "gelatinous degeneration," corresponding to the "*tumeur fongueuse*" of Bonnet. He (Brodie) also cites cases of acute synovitis, and believes that there may be a primary ulceration or absorption of cartilage by means of its own vessels, the process beginning on the free surface, as well as by extension from both bone and synovial membrane. He also describes a fibrous change in cartilage frequently preceding ulceration, and giving rise to absorption of the cartilage, the rest of the joint structures remaining normal, except that some-

* *Observations on Diseases of the Hip.*

† *Traité des Maladies des Articulations.*

‡ *Diseases of the Joints.*

times there is caries of bone but no suppuration. The change may occur in many joints.*

Ford quotes De Haen, "de Morbo Coxario," as saying that the causation is unknown, but the disease exists "in the integuments, in the cellular membrane, the membranous fascia, the muscles, the involucrum of the ischiadic nerve, the periosteum of the bone, the capsular ligament, the cartilages, the bone itself, the glandula innominata, the ligamentum teres, or finally in all the parts together." Ford remarks, not unnaturally, that "there are objections to our adopting De Haen's opinion as perfectly just and satisfactory."

Brodie says when the bone is primarily attacked it may be either inflammation of the articular lamella or a "scrofulous" change in the cancellous tissue that is the primary lesion. He lays stress upon the fact that often ulceration of cartilage and even caries of bone may go on to a considerable extent without suppuration.

In regard to the pulpy disease of synovial membrane he suggests its analogy to new growths, "tubercle, scirrhus, sarcoma, etc.," and notes with his usual exactness the fact that it is most commonly found in its typical form in the knee. He further describes a case of abscess in the hip joint, with "acute ulceration of the synovial membrane," after an injury.

Brodie also records, out of others in his experience, two cases of circumscribed ulceration of the synovial membrane, one in the hip. A child of nine years old fell and wrenched her hip. In the evening she went to a dance, but while there had a rigor. Fever and delirium followed, and she died in a week. At the post mortem examination, the organs were healthy. An ulcer as large as a shilling was found on that part of the synovial membrane which is reflected over the neck of the femur, with about $\frac{1}{2}$ oz. of dark coloured pus in the joint.

Brodie also, among several others, records the following

* This appears to be chronic osteoarthritis.

case of "ulceration of cartilage":—A girl of seven, with hip disease and a sinus. The acetabular cartilage was entirely gone, and most of that on the head of the femur. Pus and granulations were found in the joint, and there was partial dislocation. The other (left) hip joint also contained pus and had ulceration of cartilage. The bones of the right hip were darker than normal and superficially carious, those of the left healthy. The girl died of erysipelas. [Was not the affection of the left hip pyæmic, and was not the right a case of primary osteomyelitis, with secondary destruction of cartilage?]

Finally, he sums up his views by saying that a large proportion of "diseased hips" are cases of ulcerated cartilage, and "it is the disease which forms the great majority of those cases of caries of the hip joint which occur in adult persons, whereas in children the hip joint is principally affected by the scrofulous disease affecting the cancellous structure of the bones."

Key,* as is well known, originated the classical belief that the disease begins in the ligamentum teres; this Brodie did not think correct, while Key further considered that ulceration of cartilage was always the result of overgrowth of synovial fringes.

Bryant considers that hip disease is pathologically identical with other joint diseases; that it is not specially strumous; that it is local; that it is rare to find strumous or tubercular matter in the hip joint, and that as in other joints the disease may be primarily synovial or an articular ostitis.

He thinks nine-tenths of the cases in early life are ostitis, those in adults commonly synovial.

He points out that a hyperæmia of the articular extremity is followed by condensation of bone, and then by suppuration or necrosis, *i.e.*, articular ostitis, and he also lays stress on the fact that the disease may begin in the epiphysial cartilage.

* *Med. Chir. Trans.*, vol. xvii.

Billroth* considers that synovitis is the commonest beginning of hip disease, but that in tubercular people ostitis may occur affecting the joint secondarily. The synovitis may be of the ordinary form or a "serosynovitis or catarrh."

He describes "ostitis malacissans" as common in the head of the femur, the joint long remaining intact. As regards the process of destruction of cartilage, he attributes it first to an implication of it by extension from the synovial membrane, and later the cartilage cells themselves assist in the destruction of the matrix in some cases and in others take no part. He describes how while the cartilage is attacked superficially by the synovial membrane a simultaneous process of erosion by the granulations of subchondral caries may be going on beneath, and these two may meet and completely separate the cartilage. In very acute conditions the cartilage may become necrotic.

Barwell, like the majority of other writers on joint diseases, singles out hip disease. He describes it as either a synovitis or osteitis, the latter the less common. Writing in 1879, however, he believes that nearly all cases begin in bone, especially about the epiphysial or pelvic junctions.

Rust, of Vienna, believes that the disease always begins in bone.

Sayre attributes the condition to either synovitis or to rupture of the ligamentum teres and consequent failure of nutrition of the head of the bone, or to rupture of small vessels beneath the cartilage or "blood blister." He describes cases of synovitis with moderate effusion and others with great effusion and rapid destruction of the joint.

Holmes, in his *Diseases of Children*, believes the disease begins often in the ligaments. He quotes three cases where the ligamentum teres was ulcerated or injected, two of his own and one of Martin and Collineau's,† and criticises

* *Surgery.*

† *De la Coxalgie.*

Barwell's older belief that it begins in the subsynovial tissue as over exact. In a case of Holmes', figured in his book, the synovial fringes are much enlarged. He says sometimes, but less often, the disease begins in the bones. He describes the synovial membrane as converted into a thick pulpy mass. He argues that as suppuration sometimes occurs outside the joint, in those cases the ligaments were the parts first attacked. In his address to the British Medical Association, 1880, he believes disease of bone is secondary to that of soft parts, and that disease of the epiphysial cartilage is rare.

Gross* describes the disease under the heading of tuberculosis of the hip joint, and says that it usually begins in the bone.

Macnamara† says a considerable number of cases begin as a synovitis, and that in adult cases the majority are synovial. In acute cases in childhood the disease is probably an epiphysitis, excluding septic cases. He considers a considerable number scrofulous; chronic osteomyelitis spreading to the joint is a common condition.

Adams alluding to Aston Key's celebrated case, where disease is said to have spread from the round ligament to the synovial membrane, the cartilage, and thence to the bone, describes another similar case of his own, and attributes it to rupture or strain of the ligamentum teres. Coulson describes three other similar cases. Adams believes other cases begin in the bone, either femur or acetabulum.

Gay (*Lancet*, 1872) believes the disease begins in the head of the femur and extends to the acetabulum.

Howard Marsh describes the disease as sometimes scrofulous, *i.e.*, a chronic inflammation, with tendency to relapses, occurring in families with a tubercular history; sometimes he thinks the lesion is purely local. He believes that it usually begins in the bone, either femoral or pelvic. (Heath's *Dict. of Practical Surgery*, 1886.)

Edmund Owen (*Diseases of Children*, 1885) believes hip

* *System of Surgery*.

† *Diseases of the Bones and Joints*.

disease begins in the ligamentum teres after sudden and severe inversion of a partly flexed limb.

Annandale, in his book on the *Pathology and Operative Treatment of Hip Disease*, has come to the conclusion that although at times the disease may begin in the synovial membrane or pelvic bones, it most frequently attacks first the head of the femur; and while he found in all his cases the ligamentum teres wholly or partially destroyed, he thinks the condition is secondary to osseous or synovial inflammation, though the acute cases begin in synovitis, and sometimes also the more chronic cases.

Hueter* believes the disease to be primarily osteal, either femoral or acetabular, more often the former, and compares the condition to tubercular dactylitis.

More recently Mr. Croft, in an excellent paper read before a branch meeting of the British Medical Association in June, 1885, states his belief that the disease may be (1) simple; (2) strumous or scrofulous; (3) tuberculous; though distinguishing struma from tubercle thus the distinction is minimised by his subsequent remarks. He describes eighteen specimens of his own which all showed tubercles (not bacilli, which were not looked for). He remarks that Erichsen, Macnamara, Barwell, Ollier, Trelat, Volkmann, and Bruns are all more or less believers in the tubercular nature of the disease, Volkmann having found tubercle bacilli in all but five or six of his 250 cases of excision.

Koenig, of Gottingen and Berlin, found tubercular disease of bone in 67 out of 71 cases. It is not specified in the *Lancet* quotation what he means by "*tubercle*." Hulke believes that disease of any joint in childhood begins as an osteitis. Clippingdale thinks synovitis is the ordinary form of the disease (*op. cit.*).

Conclusions.—Thus it will be seen from the short statement of opinion of the several surgeons mentioned above, who have only been selected as those whose opinions are

* *Gelenkkrankheiten.*

FIG. 7.



Shows early disease. The articular cartilage is thinned and loose, especially at the insertion of the ligamentum teres. John B., case 49. Acetabulum bare.

FIG. 8.



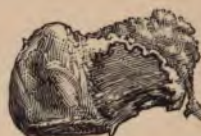
Shows epiphysitis (articular ostitis) with much thinning of articular cartilage. The epiphysal cartilage is incomplete. A thick pad of synovial membrane is seen at the lower and left hand part of the figure. Albert O., case 68. Acetabular cartilage loose.

FIG. 9.



There is disease on both sides of the epiphysal line. On the under surface of the neck is the rough depression caused by pressure against the rim of the acetabulum. There was pathological dislocation. Thomas F. D., case 79. Acetabulum rough at one spot.

FIG. 10.



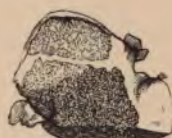
Much like *Fig. 6*. The marginal cartilage is persistent. A cavity containing a sequestrum is indistinctly seen in the "calcar femoris." A tag of loose cartilage is seen hanging from the lower part of the head. Herbert B., case 71. Acetabulum necrosed.

FIG. 11.



Shows the articular cartilage necrosed and turned back. A dark spot close to the digital fossa indicates a cavity. The trochanter is seen on the right of the figure. Emily H., case 4.

FIG. 12.



Shows disease on both sides of the epiphysal line, with subchondral caries and loosening of cartilage. The "calcar" is affected, the rest of the diaphysis being healthy. James P., case 41.

most prominently put forward and readily accessible, that there is great variety in the views held as to the Pathology of Hip Disease.

My own belief, based mainly upon 100 cases of excision of my own, as well as upon my examination of specimens removed by other surgeons, is that in true chronic morbus coxæ, such as we ordinarily see, and also in the acute and rapidly destructive cases, the disease begins almost invariably in the bone. Dr. Gibney believes that in children under eight years of age "chronic articular osteitis" is the most common lesion, while in older children the disease may begin as a "central osteitis, a periostitis, a chondritis, and a synovitis." I so far agree with him, that I believe the disease is sometimes synovial in older patients, *i.e.*, after puberty; and case 44 in the appendix is an instance of synovitis in childhood, but I look upon it as a great rarity in children. As I have elsewhere stated,* I cannot but think that the balance of evidence is in favour of the belief that an acute, subacute, or chronic inflammation of the upper epiphysis of the femur or its neighbourhood is by far the most common condition. In some cases, the disease begins in the neck of the femur, and when this is so, it is generally the under surface that is attacked, and this is the part on which, as I have already pointed out, the greatest strain comes in injuries applied direct to the trochanter, and also the part least abundantly supplied with vessels. (*Figs. 1, 10, 15, etc.*) In some cases, I have no doubt that the disease is primarily acetabular, but I am not sure of the proportion between primary femoral and primary acetabular lesions; the acetabulum is, of course, very often diseased, and it is difficult where there is great destruction of both bony surfaces to be certain in which the lesion began.

Dr. Gibney, in his excellent book on *Hip Disease*, describes an undoubted case where there was disease of both hip joints; in one the lesion was primarily femoral,

* Vide *British Medical Journal*, Sept. 1st, 1883, paper read at the Liverpool meeting of the British Medical Association.

in the other primarily acetabular. Of a hundred cases of excision of my own the acetabulum was necrosed or perforated in twenty-seven; in fourteen of these at least the disease of the femur was so extensive that I believe it was certainly primary, in some of the others it was probably so also. (*Vide Table.*)

The part of the epiphysis usually first involved is the immediate neighbourhood of the epiphysial line, and the disease commonly spreads on both sides of this line (*Figs. 3, 9, 12, 13, etc.*).

So far as my experience goes, I believe that two entirely different classes of cases come under observation; these differ in their exciting cause perhaps but little, but they differ widely in their course and termination, and in one there is a predisposing cause, while in the other there is none. The pathology of the two conditions to which I allude I believe to be this: The one is a simple traumatic synovitis such as may occur in the knee or elbow or any other joint as the result of a fall or blow or sudden over-exertion or strain; it is a lesion that occurs in the healthy or unhealthy alike, and is as amenable to ordinary treatment in the hip as elsewhere. These are the cases that recover without suppuration. The other class of cases is one composed of those where the patient is tuberculous. In these cases, there may or may not be an injury in the sense of a direct blow or fall, but there is usually either such a direct exciting cause, or perhaps merely a little over-strain of the part; the cancellous tissue of the head of the bone has its normal circulation slightly interfered with—what is the result?* These children are always living, as it were, upon the edge of a precipice; it is only under the most favourable circumstances that their nutrition and growth can go on healthily, from the fact of the tendency that they possess. Hence a slight contusion

* It is important to note that there is usually a "latent period" between the injury and the first symptoms in true hip disease, while in synovitis the mischief directly follows the injury; this latent period corresponds to the time in which the central disease has not yet reached the surface of the bone.

of bone, or a local congestion from over-use, may determine the beginning of the disease; once started, we know how caseous inflammations spread; the one cheesy spot acts as a focus of irritation to the surrounding tissues, which become inflamed, and again the inflammatory products undergo caseation and so on until the surface of the bone is reached. When this occurs, the processes go on more rapidly, tension is less, and growth more active, granulations appear and begin to strip off the cartilage, and so disorganisation goes on.

Before describing this in detail, there are one or two other points worth notice in the question of how the head of the femur comes to be so liable to this change.

First, the upper epiphysis, as well as nearly the whole of the neck, lies, as Mr. Barwell pointed out, entirely within the capsule of the joint, and in this fact differs from all other epiphyses; the result of this is that it is dependent for its blood-supply upon (*a*) vessels running along the ligamentum teres; (*b*) vessels in the "reflected" portion of the capsule and synovial membrane; (*c*) vessels perforating the *marginal cartilage* as described above; (*d*) vessels piercing the epiphysial cartilage; the sum of these, however, probably amounts to less than that of any other piece of bone in the body of a similar texture. This epiphysis is the most isolated of all the epiphyses.

Next, we know that all structures in a transitional state are more likely to become the seat of abnormal changes than their more stable fellows, *e.g.*, new growths especially select the orifices of the body, the junction line of skin and mucous membrane, etc. So the upper epiphysis of the femur is completely surrounded and encapsuled by cartilage and moreover is the seat of active change at the epiphysial line; and active change, though it may imply increased blood-supply, implies also increased delicacy of structure.

It is not, then, difficult to explain the undoubted clinical fact that hip disease is the commonest of the joint diseases in childhood, nor could we expect any other pathological condition than the one we find, *viz.*, that this isolated

nodule of bone is the part first attacked in the course of the disease.

It is contended, and perfectly soundly so, from a simple pathological point of view, that there is no difference between disease of the hip and any other joint, and, therefore, that, as synovitis is perhaps the most common form of disease in other joints, it is so in the hip.* But, as a matter of fact, any one who has made sections of the head of the femur in hip disease, will know that the bone lesions are far more extensive and constant there than in other joints (leaving the shoulder out of the question), and it is very rare to find in the hip the same condition of pulpy gelatinous synovial membrane that we find, for instance, in the knee. I do not mean to deny that the synovial membrane of the hip is thickened in disease, but it is neither so much nor so constantly affected as in many other joints. I do not, therefore, think that there is any sufficient evidence to lead us to believe that disease of the hip begins, at any rate at all commonly, in the synovial membrane.†

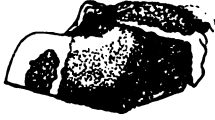
As to the view that the primary lesion is in the cartilage, we have first to remember that it is, of all joint tissues, the least prone to primary inflammation; that it is the tissue in which change is the least active, and that here the analogy of other joints does not support the belief.

Brodie's view, and that of others who have followed him, that a primary ulceration of cartilage is common, is, I think, to be explained by the appearance of pitting, and even perforation of the cartilage, with development of granulations, apparently from it, that is so often seen in the hip. When the cartilage is, as is so frequently the case, eaten away or absorbed on its attached surface by the layer of granulations covering the head of the bone,

* *Vide*, however, paper above referred to in *Brit. Med. Jour.*, Sept. 1st, 1883.

† Mr. Quain, who gives some excellent plates of hip disease, believes it to be synovial in origin, and in one case shows much synovial thickening. *Clin. Lect.*, 1884.

FIG. 13.



Shows destruction of nearly the whole epiphysis. A cavity in the upper surface of the neck, just at the epiphysal line, and a patch of disease in the shaft below. James B., case 46. Acetabulum bare and necrosed.

FIG. 14.



The head and neck removed by supra-trochanteric excision. The bone is healthy, the cartilage is superficially absorbed by pressure, and the ligamentum teres is also partially destroyed. A case of simple suppurative synovitis. George R., case 44. Acetabulum granulation lined.

FIG. 15.



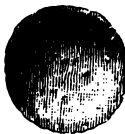
The whole upper epiphysis and a large patch in the shaft are diseased, practically necrosed; part of the shaft is seen to be healthy. A quill is passed between the dead bone and the periosteum, close to the "calcar." The specimen was removed post mortem from a child which died of tubercular meningitis.

FIG. 16.



Surface view showing partial destruction of the articular cartilage, and two cavities in the head and neck which contained sequestra. Herbert C., case 48. Acetabulum healthy.

FIG. 17.



Loose marble-like sequestrum of the entire upper epiphysis found lying loose. Ellen O'G., case 13.

FIG. 18.



The truncated stump of neck with tags of cartilage hanging from it is seen, and a sequestrum exactly like Fig. 17. Supra-trochanteric excision. Mary M. B., case 12. Acetabulum extensively diseased.

FIG. 19.



Shows complete destruction of the upper epiphysis. Some of the epiphysial and marginal cartilage remains. The periosteum of the neck has been cut away at the lower part. John T. G., case 62. Acetabulum enlarged, bone fairly healthy.

FIG. 20.



Shows destruction of nearly the whole epiphysis, and three caseous foci below the epiphysial line. Abraham C., case 81. Acetabulum rough and cartilage loose.

FIG. 21.



Upper end of femur bisected and halves turned apart. At the right side are seen the two halves of the great trochanter (white). In the centre are seen sequestra and caseous detritus occupying the neck and part of the upper epiphysis; the epiphysial cartilage is gone; the articular cartilage is thinned and perforated. John R., case 37.

FIG. 22.



Shows disease above and below the epiphysial line, which is trenched upon, and there is a sequestrum in the shaft surrounded by a large patch of pale bone, which reaches down to the line of section. James W., case 85. Acetabulum excavated.

FIG. 23.



A case much like Fig. 21. The epiphysis is just encroached upon. There is a sequestrum at the "calcar" surrounded by a cheesy area. Articular cartilage almost intact. Fred B., case 50. Acetabulum fairly healthy.

FIG. 24.



There is almost complete destruction of the upper epiphysis, the epiphysial cartilage capping the stump. A loose sequestrum occupies the position of the "calcar." The trochanter is seen on the right of the figure. Thomas M., case 14. Acetabulum diseased.

the thinned, softened, articular aspect of the cartilage which remains sinks down towards the head of the bone simply from lack of support, and so gives the appearance of superficial erosion; the edges of such a patch are often quite sharply defined, and closely simulate an ulcer.* Sometimes, also, through a small perforation in the centre of such an area, a little sprouting mass of granulations springs, that looks exactly as if it arose from the cartilaginous surface instead of, as it really does, from the bone beneath. In other cases, the erosion takes place from the spreading of synovial fringes over the face of the cartilage, or from pressure of a synovial pad belonging to the opposite aspect of the joint, but this is, of course, a sufficiently obvious condition. The view that the disease begins in the ligaments is supported by high authority, and a few years ago was the classical and almost undisputed belief, and yet the number of recorded specimens illustrating this condition is now less than six. We do not find that the pathology of other joint diseases confirms this view, nor does it appear probable from the intimate relations between the ligaments and synovial membrane that inflammation could exist in the one without so speedily affecting the other that we should be very unlikely to meet with such specimens. Still there are cases which show that in an early condition injection of the vessels of the ligamentum teres may occur, or, as in the instances recorded by Mr. Holmes, and Martin and Collineau, ulceration of the ligamentum teres and synovitis. From Mr. Holmes' figure† it does not appear that a section of the bone has been made, and it is not unlikely that bone lesion really does exist, as pointed out by Mr. Barwell.

The hyperæmia of the ligament is, I think, to be explained in other ways: first, the condition may be due to increase in the, as it were, collateral circulation of the head of the bone, which has been deprived of some of its supply by implication of the epiphysial line in the inflam-

* Vide *Fig. 2.*

† *Diseases of Children.*

matory process; next, it may be owing to extension of inflammation from the bone to the ligament, and finally, as a rarity, the hyperæmia may be due to a tubercular condition (as part of a general acute tuberculosis); one instance of this I have seen, where the patient, a boy, died of tubercular meningitis, otitis and a "pulpy" knee. I removed the head of the femur with a view of having it as a normal specimen, and found a leash of vessels running along the ligamentum teres and several more bundles, reminding one of the vessels running to and from a corneal ulcer, passing up to the edge of the cartilage in which were small opaque tubercles. The hyperæmia in this case really was synovial. A somewhat similar case of tubercle in the synovial membrane, though in it the ligamentum teres was absent, possibly congenitally, was recorded by Morgan in 1878.

As to the distinction between a "femoral" and an "acetabular" coxalgia, the point is one of extreme importance as regards the prognosis and treatment of the disease; and although I believe the affection seldom is primarily acetabular, yet it is so, no doubt, sometimes, and it is noteworthy how the anatomical points as regards activity of growth and transitional tissue referred to above in relation to the femur, apply, to a certain extent, to the acetabulum, where, during childhood, the four segments of bone, including the Y epiphysis,* meet. I believe, as will be seen presently, that it is possible, in the later stages at any rate, to tell when the pelvis is implicated.

An analysis of a hundred cases of excision of the joint under my care shows that in about ninety cases the head or neck of the femur was probably the part first diseased; in one the bones were healthy, in two others there is no record of the state of the femur. In seventeen instances there were sequestra in the femur. In the same set of cases the acetabulum was superficially diseased in forty-

*The Y does not, however, ossify till nearly puberty.

nine instances, healthy or nearly so in ten patients, contained sequestra in twenty-two cases, was perforated sixteen times, and in thirteen instances there is no record of its condition (*vide* Table of Cases). It will be seen that where the acetabular disease is most extensive, in most instances there is either very old or very extensive femoral disease, though in a few cases it is pretty clear that the mischief began in the pelvis.

Croft puts the percentage of necrosis cases at about thirty-six; the Clinical Society's committee, whose specimens were mostly removed from fatal cases, put it as high as nearly fifty-nine per cent.

The term tubercular, as applied to joint disease, is used so vaguely, and in such different senses, that it is difficult to understand what is the real opinion of authors upon it. The present tendency is, of course, to consider all these chronic joint diseases as true tubercloses, and in such cases the characteristic bacilli, if so they are, ought to be present; in many cases they have been found, but in all bone-lesions it is very difficult to be sure of their presence, and from the result of some examinations made from material, discharge, scrapings, etc., taken from joints, in some of which Dr. Foxwell, now of Birmingham, helped me, we came to the conclusion that though the bacilli may be found in some cases they easily escape notice, and that it would not be safe to say that the disease was not tubercular in cases where they were not found in joint disease. Histologically, apart from the bacilli, tubercle may be found, according to Mr. Macnamara, very constantly, and Koenig, of Göttingen, recorded an experience of sixty-seven cases of tubercle of bone, out of seventy-one cases of hip disease. I have found characteristic grey tubercles in the clear zone surrounding cheesy bone in the hip, but the common condition is, I think, simply to find the ordinary characters of inflamed bone, granular bone corpuscles, rarefaction of the cancellous tissue, and packing of the spaces with inflammatory material, while in parts, at times, sclerosis is present.

Pollasson records a case in which tubercle was found in the articular cartilage. He points out that the presence of tubercles is often obscured in bone by the ordinary inflammatory products at the time operation becomes necessary; hence he never found tubercles in operation cases. In caries he often found tubercles in the marrow spaces, and only once found them in synovial membrane without their being also present in bone. Pollasson has also satisfied himself that tubercle may cicatrise in joints by examining material from the same joint at different times. (*Vide* Canstatt's *Jahr.*, 1883.)

A good article on bone tuberculosis, by Professor Vincent, of Lyons, will be found in Ashurst's *Cyclopædia of Surgery*, giving a summary of French surgical opinion, and a figure is there taken from Dubar, which gives an excellent idea of a tuberculous hip.* In a specimen kindly prepared for me from one of my cases by Dr. Thomas Harris, the conditions are precisely similar, both as to the presence of tubercles and as to the fatty condition of the bone.

Whether pathologically there is any difference between tuberculous joint disease and strumous or scrofulous disease may still be a question, though the identity of the diseases is being more and more recognised; but clinically there is no doubt that there are two quite different classes of cases, those in which there is perhaps a single joint-lesion and no other external disease, but in which at any time acute general tuberculosis may arise; and these have often a special aspect, such as we are usually accustomed to put down to tubercle of internal organs; and secondly, those in which there are often multiple external lesions of skin, glands, etc., as well as of bones and joints, and these often do well and do not seem to develop acute tubercle, at any rate while under observation. These children are often fairly robust-looking, contrasting with the first form.

* *Vide* Volkmann, "Chirurg. Erfahrungen über die Tuberkulose," *Deutsche Mediz. Zeitung*, No. 30, 1885 (abstract in *Medical Chronicle*, vol. ii., 1885, p. 302).

Whether there is any real distinction between these two types, other than that the first are the subjects of a more generalised visceral tuberculosis, while in the latter it is localised and chronic, I should be inclined to doubt; but the difference from a prognostic point of view is great. In the first set, I should be much more loth to advise operation than in the second, and much less hopeful as to the result. I admit that there are, apparently, border-land cases between these two types, and that sometimes fatal lesions of spine, etc., may develop in the chronic class; but I think it important to recognise the fact, and I think it is the clinical difference that has given rise to the divergence of view between those who speak of scrofula or struma and those who speak of tubercle. In a separate group may be placed the cases where apparently healthy children become the subjects of chronic monarticular disease; these are the cases upon which believers in the non-tubercular origin of the disease rest. For my own part, I believe all are mere varieties of tuberculosis.

I do not propose here to discuss further the question of the relation of the lesion in hip disease to tuberculosis generally, but it must be borne in mind that the point is one of much importance as deciding the question of operation. The Clinical Society's committee collected 108 cases of hip disease ending fatally; thirty-seven of these died of tubercular affections, and my own experience bears out the conclusion that, clinically, we very often see the two associated.

The naked-eye characters of a typical specimen from well-advanced hip disease are:—the cartilage is all gone, or hanging in tags or worm-eaten plates, or merely loosened and thinned with granulations beneath it; the synovial membrane moderately thickened, or in many cases but slightly so, red and vascular, rarely grey, thick, felt-like and semi-transparent, as in the knee; the bone as seen in section varies somewhat, but certain characters are exceedingly constant. In some cases, not very commonly in my experience, though more so in that of some surgeons,

notably Mr. R. W. Parker,* the upper epiphysis forms a loose, hard, marble-like sequestrum (*Figs. 17 and 18*); in the majority the upper epiphysis is destroyed to a greater or less extent, sometimes gone altogether (*Fig. 19*), sometimes only about a quarter of it or even less has actually disappeared; but in all it is of a dull, yellowish-white colour; in late cases the colour is opaque and the bone is putty-like, with or without obvious rarefaction; in earlier cases there is a mottled appearance, patches of dark-red hyperæmic bone being scattered about, or rather surrounding islets of the dull yellow appearance; occasionally in the early specimens a soft patch may be seen where greyish-pink granulation tissue has developed, abrading the bone trabeculæ. Sometimes a sequestrum lies in the epiphysis itself, more often it involves both sides of the epiphysial line (*Figs. 13, 15, 21, 22, etc.*). The epiphysial cartilage itself may, to the naked eye, appear little altered, or may be perforated by a sprout of granulation tissue, or again may, together with the epiphysis, have entirely disappeared, leaving a truncated stump of neck (*Fig. 30*). Occasionally we find the remains of the epiphysial cartilage capping the stump of neck left by destruction of the head (*Figs. 19 and 24*). Sometimes the cartilage is, like its articular fellow, lifted up by a layer of granulations, and thus detached. In a good many instances sequestra of varying size, or deep excavations from which sequestra have escaped, will be seen in the neck usually on the under surface, and below, but near the epiphysial line (*Figs. 10, 11, 16, 24, 25, etc.*). The characters of the cut surface of the neck resemble those of the head where the disease has spread below the epiphysis; in other cases the bone may appear nearly healthy on section, being, perhaps, merely engorged.

Sometimes there is a sequestrum extending some little distance down the shaft, but most often the bone below the common section line in excision, *i.e.*, the lower part of the trochanter, is healthy or only darker in colour

* *Clin. Soc. Trans.*, 1880.

than normal; it may, however, be soft and rarefied. The various types of disease mentioned are seen in *Figs. 2—30*.

The trochanteric epiphysis is seldom diseased (*Fig. 30*). I have seen it so in only two or three out of a hundred cases. The extent of disease can only be seen by making vertical sections of the bone, and this is best done with a strong knife and mallet. The acetabulum is usually lined with granulation tissue, the cartilage more or less stripped off and the bone surface often rough and eroded; this erosion is most common in the floor, but may extend for some distance around the margins, which are frequently absorbed so that the cavity is wider and shallower than in health. Perforation of the acetabulum is quite common in advanced cases; there are then usually sequestra, varying in size from a pea to a filbert, lying loose in the cavity, or in an adjacent abscess. Occasionally nearly the whole pelvis is necrosed, as in Mr. Erichsen's classical case* (cf. *Fig. 31*). When perforated, a dense wall of thickened fibrous tissue shuts off the joint cavity from the pelvis, but a finger in the rectum can be readily felt pressing against this fibrous wall. The bone is often soft, hyperæmic, and rarefied, in other less common cases yellow and caseating as in the femur. These changes in the acetabulum are less common by far than in the femur, and chiefly seen in old cases that have been left too long. Sometimes in far advanced though not necessarily old cases the outer surface of the acetabulum is bare and perforated by a small opening; on enlarging this it will be found that the internal pelvic periosteum is detached also, and thus the bone is bare on both surfaces.

The joint cavity contains pus and false membrane with broken-down caseous granulations and detritus.

The course and position of abscesses will be considered later in reference to the localisation of the lesion.

Chronic disease, then, of the hip begins as an osteomyelitis of the head or neck of the femur, occasionally of the

* *Science and Art of Surgery.*

acetabulum, and though its ultimate practical results are very similar, a certain variety in its course is often seen.

Disease of the hip may be set up by extension from neighbouring parts, such as a psoas or pelvic abscess bursting into the joint, or by extension from osteomyelitis of the shaft of the femur, as in *Figs. 2* and *33*, where, however, the course of the disease is exactly as here described, but these are rather accidental conditions than fair illustrations of ordinary hip disease. Even if hip disease did not begin as an osteomyelitis, but as a synovitis, the condition actually found to exist does not permit of recovery without removal of the disease when well established.

In an ordinary case, such as the majority of specimens show, the inflammatory process extends from the cancellous tissue in various directions until it reaches the surrounding cartilage. The cancellous spaces are filled with soft, inflammatory material, *i.e.*, granulation tissue, and, like granulation tissue elsewhere, this material produces softening of the parts in its neighbourhood, and extends along the lines of least resistance; hence, as soon as the surface of bone next to the articular cartilage, the articular lamella, has yielded to the inflammatory process, the granulations begin to protrude more prominently from the bony surface, and press upon the under aspect of the cartilage. Partly by the pressure of this growth producing absorption, and partly by its mechanical separation of the cartilage, the latter begins to loosen, and at the same time diminishes in thickness and becomes opaque and dull, in fact necrotic (*Figs. 11* and *28*).

Next, the inflammation extending through or round the edge of the cartilage at various points reaches the cavity of the joint, and the synovial membrane and ligaments become involved, and so the whole joint is inflamed.

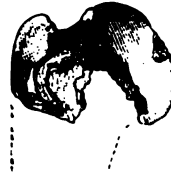
Now, as the cartilage in the neighbourhood of the ligamentum teres is thicker than elsewhere, and the ligament is inserted into a depression in the head of the bone, it follows that the inflammation will attack the ligament, and extend into it more quickly and easily than through

FIG. 25.



A specimen much like the preceding, but less advanced. The cavity in the neck, from which a sequestrum has escaped, is seen on the left of the figure. Mary F., case 52. Acetabulum necrosed.

FIG. 26.



A surface view, showing extensive necrosis along the epiphysial line, nearly severing the head. The trochanter is on the left of the figure. Elizth. B., case 82. Acetabulum granulation lined.

FIG. 27.



There is a large sequestrum in the neck. The head, which is still cartilage covered, but is almost detached, is propped up by a quill. Vascular perforations are seen in the marginal cartilage. Removed post mortem. Emily B., case 5, Appendix ii.

FIG. 28.



Plates of necrosed cartilage found lying loose in the joint cavity.

FIG. 29.



Shows disease on both sides of the epiphysial line, which is perforated. There is subchondral caries, and the diseased (pale) bone reaches down beyond the line of section, which is supra-trochanteric.

FIG. 29A.



From a case of old hip disease requiring amputation. The stunted remains of the head are seen on the left side of the figure, and the disease has spread a considerable way down the shaft. Peter H., case 19, Appendix ii. Acetabulum bare; sequestra in joint.

FIG. 30.



Shows complete destruction of the head and nearly the whole of the neck, with caseous infiltration of the shaft and trochanteric epiphysis. Close to the trochanteric epiphysal cartilage is a sequestrum. The trochanter is on the right side of the figure. Thos. B., case 32. Acetabulum bare and excavated.

FIG. 31.



Shows extensive acetabular disease. The ilium is completely detached from the other two bones, and is largely necrosed; white scale-like patches of new bone are seen on the surface. Joseph P. H., case 11. The disease was acute.

FIG. 32.



Shows the upper end of the femur some time after excision. The bone is healthy, and many irregular osteophytes are seen. The line of section is still spongy. The section was supra-trochanteric, and the remains of the trochanter form the high projection on the left hand of the figure; the projection on the right is a mass of new bone. Removed by amputation. Ralph D., case 18. Appendix ii. There was pelvic disease, and the boy was lardaceous.

FIG. 33. Vide Fig. 2.



The shaft of a femur in section, showing chronic osteomyelitis (condensing), which spread upwards and involved the hip joint (*Fig. 2*). Removed by amputation.

the cartilage, hence the ligament becomes early softened and destroyed, and as the mischief spreads along it to the acetabulum the bone there is liable to be affected by direct extension. Further, the destruction of the ligamentum teres may, as pointed out by Bauer, partially deprive the epiphysis of its blood supply, and so the degenerative processes go on more rapidly still in the head of the femur. As soon as the synovial membrane becomes involved, effusion into the joint occurs, and the effects of tension throughout the articulation are added to the evils already existing.

So far, the process is similar in the majority of cases, but certain variations in the process occur which modify the results in different instances. Thus the inflammation in the bone may extend through the central part of the epiphysis to the articular cartilage, or it may extend along the epiphysial line, being for a time limited by the epiphysial cartilage, and so reach the surface of the bone; here the changes will affect the margins of the cartilages most, and as soon as synovitis occurs, the vascular synovial fringes will creep over the cartilage, and beneath it, and aid in the destructive process. A second focus of inflammation may occur and be the starting point of a fresh series of changes, so that the disease may go on *pari passu* in the epiphysis and the neck (Figs. 29 and 30).

Soon after the synovial sac becomes inflamed by perforation of the cartilage, bands of lymph, or even of organised tissue, may be found projecting from the head of the bone.

When once the disease has begun to attack the bone below the epiphysial line, there is no limit to its extent; it may travel along the neck to the shaft for an indefinite distance. Soft, caseous cavities and sequestra are often found. In a certain number of instances the process seems to be rather more acute, and to extend rapidly along the epiphysial line without actually encroaching on the upper epiphysis; it then destroys the cartilage of the epiphysial line completely, and throws off the head as a loose, dry sequestrum; most commonly, however, the

epiphysis itself is at the same time inflamed and partially eroded, or it may be sclerosed (*Figs. 17 and 18*). Mr. R. W. Parker found this condition in five out of eight cases, and Mr. Marrant Baker in eleven out of twenty-four; this, however, does not represent a true average; it is not nearly so common as this. In my own 100 cases there were sequestra in the femur in seventeen instances,* in about forty-five cases the epiphysis alone was diseased, while the shaft was affected as well as the epiphysis in greater or less degree in about fifty-three joints, in one or two instances there were two independent foci in the femur, and in one case the disease was synovial only (*vide* Table of Cases).

When, as a result of the inflammation within the joint, the capsule gives way, which it does most commonly, but not invariably, at the lower and back part, where it is thinnest, the pus escapes into the surrounding tissues, and sets up further suppuration there.

Periarticular abscesses may result, as Mr. Barwell has described, without there being direct communication with the joint; but are, I think, often due to the inflammation having reached the surface of the bone beyond the limits of the capsular attachment. Mr. Holmes considers it evidence of primary ligamentous inflammation. However, I think there is communication with the joint more often than can be readily made out; it is often not easy to find the opening, although it really exists. The periarticular abscesses due to disease of bone or joint must be carefully distinguished pathologically from those abscesses which form in the neighbourhood of the joint from some independent cause, such as bursitis, disease of the trochanter or pelvis, etc.

The conditions commonly found in the acetabulum have been already mentioned; it should, however, be stated that in the later stages of the disease, what is called "travelling acetabulum" may be produced where repair to some extent .

* In six in the upper epiphysis only, in eight in the neck, and in three in both together.

is going on; the rim of the acetabulum is destroyed by what looks like a sort of ploughing-up process, and when repair begins, new bone is formed higher up on the dorsum of the ilium to form a socket for the end of the bone. In some instances the innominate may be separated into its component bones, as in two specimens in my collection (*Fig. 31*).

In other cases suppuration may occur within the pelvis, either as a result of perforation of the acetabulum or of extension of inflammation through the thickness of the bone, or of pus, as it not unfrequently does, pouring over the brim of the pelvis and then gravitating downward. I have seen several cases where pus has burrowed up the sheath of the psoas and so got within the pelvic cavity.

The remains of the head of the femur may lie in the little-altered acetabulum, or be drawn upward upon the dorsum, or even project through the acetabulum into the pelvis; it has even been found fixed to the acetabulum, though quite detached from the femur, or rarely firmly impacted, as I have seen it. The amount of acetabular disease depends, apart from the possibility of the origin of the affection there, upon the fact that when once the joint cavity is involved, a large surface, *i.e.*, the whole acetabulum, is at once exposed to irritation, and so the process in it is more rapid; it also depends upon how much the head of the femur has been allowed to press upon the pelvis.

It is very rare to find any attempt at a new formation of bone while the disease is progressing, while, after removal of the upper end of the femur, new bone may be rapidly formed (*Fig. 32*); in this, of course, the hip resembles other joints. This rapid formation of new bone after excision is a strong indication for that operation, in that it shows that nature is unable to begin repair until the disease is removed.

Professor Sayre's views of "blood blister" or local subchondral extravasation are wanting in anatomical proof, though such extravasation very probably does occur in conjunction with bruising of bone.

As an illustration of subsynovial extravasation, I have been able, through the kindness of my friend Professor A. H. Young, to insert the accompanying sketch taken from an old woman who fractured the upper part of the shaft of her femur, and died shortly after.

FIG. 34.



From a Case of Extra Capsular Fracture of the Femur.—A, A, A, Lines of fracture running through the trochanter. B, Subsynovial extravasation of blood. C, C, Patches of degenerated cartilage from early osteoarthritis. (From a drawing by Prof. A. H. Young.)

A well-marked circumscribed patch of blood effusion is seen beneath the synovial membrane at the lower part of the joint, and this, together with blood extravasation into the cavity of the joint, is the condition found in acute traumatic synovitis at its earliest stage. It is easy to understand both the pathology and result of such an inflammation. It begins in the synovial membrane immediately over the blood effusion and involves the joint directly. It simply requires a subsidence of an acute inflammation of an elastic structure, like synovial tissue, and a reabsorption of a little effused blood to restore the joint to its normal condition. This process differs very widely from either an acute or chronic inflammation of a dense unyielding structure like bone, which simply becomes, as it were, gangrenous from strangulation of its own vessels

by exudation. Hence we see the one series of cases recover, the others steadily get worse.

The conclusions, then, as to the etiology and pathology of morbus coxæ, that seem to me deducible, are:

1. That hip disease is dependent upon that deficient power of recovery and tendency to caseous degeneration which may be called strumous or scrofulous disease, or, better, tuberculosis, and that this constitutes the predisposing cause. It is in fact a local tuberculosis.
2. That any slight or severe injury, over-use, etc., or the onset of a specific fever, may, in such a constitution, prove an exciting cause.

FIG. 35.

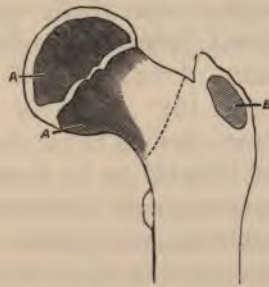


Diagram showing at A, A (in vertical shading) the parts most commonly affected in hip disease. B is the trochanteric epiphysis. The lower A points to the "calcar." (Altered from Barwell.)

3. Injury in a healthy child may produce synovitis, or even acute inflammation of bone about the hip, as elsewhere, but this does not, except very rarely, lead to chronic hip disease.*

4. In the vast majority—almost the whole—of the cases of "morbus coxæ," the disease begins as an osteomyelitis of the upper epiphysis of the femur, or of the immediate neighbourhood of the epiphysial line (Fig. 35).†

5. This particular osteomyelitis tends to destruction,

* For a case of suppurative synovitis, *vide* George R., case 44 (Fig. 14).

† Marboux, from an experience of forty cases, believes that the disease always begins in the neighbourhood of the epiphysial line (*vide* Canstatt's *Jahresbericht*, 1883). From the *Gaz. Hebdom. de Méd. et de Chir.*, No. 39.

and usually runs a chronic course with caseation of the inflammatory material, and resolution can rarely, if ever, be expected when the disease is well established.

6. The occurrence of the disease in childhood is explained by the physiological and anatomical peculiarities existing before puberty.

Besides the common chronic hip disease, there is a form of *acute hip disease* which may run its course in a few weeks, or even days, and produce as much or more destruction of parts than months or years have in the chronic cases. Instances of this condition are not very rare; every hospital surgeon sees them occasionally. Such are the cases recorded by Mr. Holmes* and Mr. Annandale,* and a specimen of another was kindly given me by my colleague, Mr. Thomas Jones, who excised the head of the bone successfully. I have myself also had several such cases (vide *Fig. 18*). Some of these cases are probably pyæmic, others belong to the class of "acute suppurative arthritis of infants," to be mentioned hereafter; others again are acute traumatic inflammation, synovial or osteomyelitic; possibly in some partial separation of the upper epiphysis may occur with rapid necrosis; others again are probably cases of acute periostitis of a nature similar to that occurring in the shaft of the femur, tibia, etc. These last may result in widespread suppuration and necrosis of the pelvis and femur. An acutely destructive condition may come on in the course of chronic disease. I have unfortunately had two cases where, after opening the capsule of the joint to relieve tension and evacuating some pus, the wounds became septic and rapidly went on to widespread destruction and death, in spite of free drainage and excision.†

Lastly, acute tuberculosis sometimes leads to rapid suppuration.

The present work is not intended to include any discussion of the microscopic appearances found in hip disease,

**Op. cit.* †*Vide* cases 6, 11, 12, 85, and cases 16 and 17 in Appendix ii.

nor do those appearances differ from the conditions seen in other joints and in bone where similar changes are going on. I have, therefore, avoided any detailed description of the morbid histology of the disease. An interesting paper by Charcot, in the *Revue de Chirurgie* for May and following months, 1884, summarises the general question of tuberculosis in joint disease, and there is little doubt that all cases of true chronic hip disease are truly tuberculous, though bone, of all tissues, is probably the one where bacilli are least easily identified. Koenig, of Berlin, after long experience, comes to the same conclusions.*

* Castro Soffia, *Revue de Chirurgie*, noted by Poirier, in *Le Progrès Medical* for September 12th, 1885, on the absence of bacilli in bone tuberculosis, considers inoculation experiments on animals to be the only trustworthy test.

CHAPTER IV.

SYMPTOMS.

IN describing the symptoms of hip disease, it will be convenient to take them one by one, and discuss the views and explanations of each symptom before passing on to the next, and finally to group them together in a type case.

Pain.—Pain is a prominent feature of most cases of hip disease from the beginning; at least, until complete disorganisation of the joint and displacement or destruction of the head, or recovery.

The seat and degree of pain are, however, alike very variable. Thus pain may be referred to the hip itself, the buttock, the back or front of the thigh, the knee in front or behind, or any part of the leg or foot. It may be localised or diffused so that the patient strokes the whole thigh down in some cases when asked where his pain is, and but rarely points to any one spot. In twenty-seven cases of hip disease taken at random, in nine the pain was in the knee, in nine in the hip or groin, in three in the hip and knee together, in three in the knee and subsequently in the hip, in the hip and thigh together in one instance, in one in the thigh and subsequently in the hip, and in one in the thigh and knee. There was no consistent relation to be made out between the seat of pain and the position or extent of disease. Probably the front and inner side of the knee is the most frequent seat of pain. Tenderness, however, is often much more localised to the position of the joint, but even that is very variable. Pain is, undoubtedly, often remittent, sometimes an interval of some weeks intervenes, even without treatment, between the attacks. I have seen cases where the child had been walking about with a

shortened, distorted limb, who never had any pain from beginning to end ; and others, with large abscesses, who have also been throughout free from pain ; while the agonizing pain of those who have to endure "night startings," is only too familiar to all who have been residents in hospitals.

In considering the question of pain, it is well to bear in mind the anatomical points specified in a former chapter, and the number of different sources of nerve supply to the joint.

It is not practicable, or very important, to distinguish by a knowledge of the nerve distribution the exact patch of synovial membrane or ligament that is locally inflamed ; its only value, if it were possible, would be from a prognostic point of view ; but here history, duration, and other symptoms are more trustworthy. There is, however, no doubt that "night pains" give us evidence of extension of the disease to the articular surface.

It will further be seen that the ideas of the evidence to be obtained from pain alone, given by some of the writers quoted, do not agree with the views here put forward of the pathology of the disease.

Brodie held that in synovitis of the hip, as opposed "to ulceration of cartilage," the pain is referred to the upper and under part of the thigh, immediately below the origin of the adductor longus, and not to the knee, and that it is increased by extension and not by pressure upon the articular surface. The pain also differs in character in the two conditions.

"In 'ulceration of cartilage' the pain at first is trifling and only occasional, afterwards becoming severe and constant, and often has no certain seat ; as the disease advances the pain becomes worse, especially at night with startings." "Some positions give relief to some cases, others to others. As the pain increases it becomes more localised, usually in the hip and knee, and is increased especially by pressure of joint surfaces together." Here is a good description of what now is believed to be the pain in chronic osteomyelitis

going on to implication of the soft parts of the joint. He (Brodie) says the formation of pus is indicated by aggravation of pain.

Scrofulous disease of bone is, according to him, less painful than other forms. He attributes the pain largely to stretching of nerves over an abscess.

Bonnet believed that the pain in the knee is in great measure due to the fact that many of the patients lie in bed with the limb abducted and rotated out, and resting upon the ankle; the knee then being unsupported, there is a tendency to strain of the external lateral ligaments, and dislocation of the knee outward and backward with accompanying pain. In one case he did find actual disease of the knee, which he attributes to this cause.

I have three times* seen disease of the knee coexisting with disease of the hip on the same side (*vide* cases 17 and 47). May not this be a case of reflex trophic nerve lesion?

Erichsen considers that pain in the knee is most marked in "femoral coxalgia," from stretching of the obturator nerve over the abscess, or from its being involved in thickened tissue. Pain is felt in the hip joint in "arthritic coxalgia," and is acute; and pain in the iliac fossa or side of the pelvis in "acetabular coxalgia."

Bryant says that persistent pain without fulness, increased on firm pressure, indicates disease of bone.

Billroth affirms that great pain and early atrophy of muscle, with little or no suppuration, in children, means primary disease in bone.

Barwell believes that in cases of chronic synovitis pain may be absent at first, but later is continuous, and worse after exercise. There is no pain in the knee.

In osteitis he says there is dull, heavy, aching pain, not increased by exercise, and generally worse in bed at night. There is early pain in the knee, and in the second stage of the disease constant pain in both hip and knee.

The pain in the knee, he remarks, is not localised, but

* Mr. Pick records another case, *vide infra*.

usually over the inner condyle of the femur ; it may be remittent or constant, and sometimes suddenly acute. Increased severity of pain indicates onset of the third stage. I have not been able to satisfy myself of the relation of the position of pain with the position of disease, but I think pain over the adductor longus tendon means usually pelvic disease, just as abscess there does.

The causes of the pain mentioned are, first:—the supply of both knee and hip by the obturator, sciatic and anterior crural nerves ; second, sympathy between the ends of the bones or direct extension of inflammation ; third, muscular spasm.

Barwell quotes Wedemeyer's case as showing sympathy ; there pressure on the head of the femur exposed in a wound produced pain in the knee ; it was supposed to be propagated along either the medulla, periosteum, or nerve trunks.

Sayre attributes the pain to the struggle between the adductors and the distended capsule.

Gross records one case of pain at the tendo-Achillis, and another over the instep, and says the pain may be intermittent even for long periods. He lays great and perhaps excessive stress on pain in the knee as pathognomonic.

Macnamara says that cases where excessive pain follows within a fortnight of an injury, with distension of the joint, are probably cases of acute epiphysitis or synovitis, the former not often occurring in children over five years old. Acute traumatic synovitis generally sets in within a few days of the injury with much pain. If the disease begins with rather indefinite symptoms and slight pain, it is probably a case of tubercular osteomyelitis, especially if the patient is scrofulous.

Adams believes that a state of acute pain often indicates the transition from the first to second stage of the disease, and it may last two or three months.

Davis, of New York, in 1856, was the first to introduce the systematic use of weights for extension ; he attributed the pain to pressure of the two articular surfaces together.

It is, then, clear that pain in cases of hip disease is variable in its seat, or rather that it may occur in a great many different places; of these special attention has always been paid to pain in the knee, and several explanations, as will have been seen by the preceding references, are given of this pain. Of these we may safely exclude two—the “sympathy” theory and the theory of extension through the medulla. There is no evidence to show that extension of inflammation along the whole length of the shaft of the femur is anything but a rare condition. Bonnet’s view, that the pain is due to strain and extension of the knee from position, has, I think, more truth in it than it usually gets credit for. I believe that in a good many cases it is the result often of a prolonged maintenance of one flexed or otherwise strained position. In 1868, Pick excised the hip in a scrofulous child aged five years. The disease had existed two years, and there was one inch shortening with “dislocation” and sinuses; the acetabulum was diseased. A long splint was used. After six months there was one inch shortening, mobility, and firm union, but unfortunately disease of the same knee.* In the majority of cases, however, it is probably due to “transferred sensation” from one of three sources, the anterior crural, the sciatic, or the obturator, branches of which are distributed to the front and back of the joint. In my experience, the pain in the knee is generally rather vaguely referred to the front of the knee, the child passing its outstretched hand over the whole of the front of the joint, instead of, as in a case now under my care, putting one finger in the middle of his popliteal space. The pain, in fact, is referred rather to the distribution of the anterior crural than of the obturator.†

Pain in the hip is not usually a marked sign in the

* I have, as already remarked, two or three times seen disease of the knee coming on in the course of morbus coxæ.

† Jacobson has pointed out in Hilton’s *Rest and Pain* that the branch of the obturator to the inner side of the knee is not a constant one, nor indeed does it supply the most common seat of pain.

sense of there being any constant pain; tenderness on pressure over the front or back of the capsule, and pain in pressing the trochanter inward or the head of the bone upward, is, of course, present in all acute cases, and a large proportion of the chronic ones.

Pain in the thigh, chiefly diffused over the front of the limb, is a common complaint, and is due to sensation transferred to the cutaneous branches of the anterior crural. Night startings or pains are a prominent and important feature in acute and subacute cases; they may be altogether absent in chronic disease—except where acute mischief has supervened upon chronic—and they may be absent throughout the whole course of a case. When they do occur, they indicate that inflammation has extended to the joint surfaces; and further, that our means, whatever they may have been, of treating the lesion, have been inefficient so long as these startings continue. Their cause is too well recognised to need discussing. The rigid muscles, acting under the influence of "joint sense" (Barwell), contract spasmodically to fix and immobilise the joint surfaces; as sleep comes on with its accompanying muscular relaxation, some friction or pressure of the tender surfaces together takes place, causes acute pain, a sudden awakening with a cry and a violent spasm of the muscles to again fix the joint. This may be repeated many times in a night, and is a strong indication for treatment. These night pains are very uncommon after excision; where they do occur they mean that disease is extending in the pelvis, and probably the femur is not kept sufficiently far away from the acetabulum to prevent pressure upon it; in such cases, then, it is well to increase the extending force, though in some cases too great extension may increase pain. Tenderness or pain on pressure has been already alluded to. When superficial tenderness really exists, the fears of the child, if he has already been ungently handled, being taken into account, it means that supuration has occurred in the soft parts, and is becoming superficial, or, in very acute cases, it seems that really all

the parts in the neighbourhood of the joint are hyperæsthetic; it is certainly the case that in no joint does inflammation extend so widely among the soft tissues as in hip disease.

When, however, no pain is produced, except on deep pressure applied over the head of the bone, it is probable that the disease is limited to the bone, and has not yet set up mischief of any serious nature within the joint; or, at least, that any such change is a very chronic one. It is well to bear in mind that pressure on an inflamed ligament is very painful indeed—a fact easily verified in chronic synovitis of the knee, and it is possible that the pain in these cases may be due to extension of the disease to the capsule rather than to the inflammation in the bone itself.

Certain movements of the joint are more painful in case of inflammation than others, and it is true that a patient may have quite or almost painless power of flexion of the joint, and yet be quite unable to bear rotation or adduction.

Night startings may exist and be due to hip disease without any recollection of pain on awaking; but Howard Marsh cautions us against mistaking the cries of nightmare for those of night starting. He describes pain as occurring vaguely about the hip, or knee, or thigh, in relation to the distribution of the obturator, sciatic, and anterior crural nerves. He mentions the branches of the obturator nerve to the ligamentum teres, the psoas, the sacro-iliac joint, and the adductor muscles; also the one to the knee penetrating the capsule at the back with the articular artery, as well as cutaneous branches to the obturator plexus on the inner side of the thigh, and a cutaneous branch to the inner side of the calf,* and says that pain may be reflected to any of these regions, at the same time remarking that such pain may be due to sacro-iliac disease, cancer of the colon, and psoas abscess.

It is well to remember that inflamed inguinal glands

* *Vide note supra.*

may cause pain and tenderness, which must be distinguished from that of the joint itself.

Lameness.—Limping or lameness is the symptom usually first noticed by the parents in the case of children with chronic hip disease. Even this, however, may be preceded by a feeling of tiredness or ill-defined aching about the limb after exercise, the aching passing off after rest, but recurring again after less and less exertion. The limping may be quite painless at first, and differs in appearance from the well-marked "drop" seen in later stages, when there is shortening of the limb. At this time the child generally shows a tendency to rest the affected leg, and throw the weight upon the sound limb at every opportunity. Later, well-marked lameness comes on and is accompanied by pain. It is at this time that the mistakes in diagnosis are so often made; the obvious symptoms are lameness, and often pain in the knee or thigh; there is no other marked sign, and the condition is supposed to be disease of the knee or "weakness" with "growing pains," and so on. This stage requires careful and exact investigation to discover it, and at the same time is the period at which treatment is most effectual. Later in the disease, lameness is due either to actual shortening, or to tilting of the pelvis to take the strain off the tender limb, or to flexion.

Heat.—Increased temperature in the joint is, of course, only apparent where the inflammation is acute, and from the thickness of the parts covering the joint is not readily ascertained; it is not, therefore, a symptom of much value, except in the third stage, where superficial swelling combined with heat indicates the presence of suppuration outside the joint. In some cases of acute synovitis, pure and simple, a local rise of temperature may be made out, and is a valuable indication of acute inflammation of the soft tissues.

Swelling.—Swelling is one of the most important symptoms. In the first place, local swelling over the front and back of the joint—*i.e.*, just external to the femoral vessels or pushing them forward, and just behind the trochanter

obliterating the normal hollow—indicates effusion into the synovial sac, and, with a recent history of injury, indicates an acute synovitis. With a longer history such swelling is due to the secondary inflammation of the joint by extension from the osteomyelitis.

Swelling of the great trochanter, as I have later pointed out, indicates suppuration within the joint, and I believe may be relied upon as pathognomonic of it; it is true that in a small number of cases this thickening may disappear under treatment, but none the less has there been pus there which has been absorbed as far as its fluid portion goes, and if once that thickening has occurred, I do not think any case is free from danger of relapse.*

Of course I am not referring to the thickening that remains after external suppuration or operation. General swelling around the joint indicates suppuration external to the capsule, and is, therefore, found only in the third stage. I say *only* advisedly, for although in opening abscesses around the hip a finger passed into the wound may fail to find the opening into the capsule, it is usually not because it is not there, but because it is not at the part exposed. Periarticular or "adjacent" abscess certainly does occur, but not so commonly, I think, as some writers describe.† Swelling of the inguinal glands is considered by Mr. Barwell to indicate osteitis. I would go even farther, and say that I believe it often indicates disease of the pelvis rather than of the femur.‡ Fulness in front of the joint, causing obliteration of the fold of the groin, if marked, and especially if it extends upwards towards Poupart's ligament, points to disease spreading in the pelvic bones or along the sheath of the psoas.|| The

* This thickening results from extension of the disease from the interior of the bone to the surface, and, as soon as the cavity of the joint is involved, suppuration almost invariably occurs.

† Cases 21 and 22, Appendix ii.

‡ It is common to find some enlargement of inguinal glands in tuberculous children, but I think they seldom suppurate unless the pelvis is diseased. The condition of the iliac glands will be noticed again.

|| Note also adductor abscess, *i.e.*, suppuration pointing over the origin of the adductor longus.

subject will be further discussed in considering the question of abscess and its treatment.

Muscular Spasm.—Spasm of the muscles around the hip is, as in the case of other joints, an almost universal condition,—quite universal if we except those cases of osteomyelitis where the inflammation is as yet limited to the bone, and the few cases where the joint is slowly and painlessly disorganised,—cases already alluded to under the section of pain.

The spasm is due, as is well known, to two causes: reflex spasm from irritation of the terminal nerve filaments supplying the articulation, the stimulus being reflected in accordance with Hilton's laws to the muscles moving that joint—Barwell's "joint sense;" and secondly, a voluntary contraction of the muscles to prevent movement of the painful surfaces the one upon the other.

It is well known to what the particular position of the joint in disease is due; flexion and abduction, as long as it remains a closed cavity, is the position of least tension, and therefore of least pain; the aggregate mass of flexors, too, is stronger than the extensors here as elsewhere, so that flexion is the position of rest.*

The rigidity of the spasm is very great indeed, so much so that in many cases, without painful manipulation, it is impossible to say from mere physical examination that the joint is not ankylosed. In most cases, however, there is a certain limited range of movement allowed through, perhaps, 10° in the middle of flexion, and in many cases a considerably larger range, while in some it is only in extreme flexion and extension that spasm exists.

Nocturnal spasm has already been alluded to under the section of pain.

Fixation or Rigidity.—Fixation of the joint, apart from muscular spasm, may depend upon any one of three causes, but can only exist in the second or third stages of the disease, or as a result of quiescent or cured disease.

* *Vide* also the chapter on *Stages of the Disease*.

The causes are adhesions within or around the joint, matting together of muscles so that their power is lost, or bony ankylosis. In the two former careful examination will nearly always reveal, if no mobility in flexion and extension, yet some in rotation inwards; while, on the other hand, the movements of abduction or adduction are abolished, if anything, earlier than those of flexion and extension. Chloroform at once reveals the nature of the rigidity, whether it is due to mere muscle spasm, when, of course, it will disappear; or to adhesion or permanent muscular contracture, when it can generally be sufficiently overcome to show that there is no bony union of the parts, as in the following case.*

FIG. 36.



A case of rectangular flexion of the hip with fibrous ankylosis.

Herbert H., æt. six years, admitted August 18, 1881, discharged October 5, 1881. Family history; an aunt has hip disease. Duration of disease three and one-half years. Has never been in bed.

Condition on admission.—Right thigh so flexed that when leg and thigh are fully extended, only the crown of the head touches the bed (*Figs. 36 and 37*). Very slight if any mobility. No active signs.

* Edmund Owen advocates examination for rigidity by outward rotation, and points out that even under chloroform some stiffness persists if the joint is tensely full of fluid. *Med. Press and Circular*, December, 1881.

Treatment.—Limb brought down under chloroform and a Bryant's splint applied.

Result.—Angle of flexion less than 30° . Sent out in plaster-of-Paris splint. December, 1881.—Flexion to 45° . No pain, limb fixed.

FIG. 37.



Showing the extreme lordosis produced by partial correction of the flexion in the preceding figure.

Until examined under chloroform it was thought that bony ankylosis existed, and that osteotomy would be necessary to straighten the limb.

July, 1885.—Is quite quiescent, but still some flexion which is being corrected by a Thomas' splint. October, 1886, is in hospital again with a large abscess (residual).

Grating or Crepitation.—Grating felt on movement of the hip joint can be due to one cause only, the presence of exposed bone. This may be either due to erosion of cartilage allowing the bare head of the femur to grate against bare acetabulum, or to sequestra grating against one another, or to the upper end of the femur rubbing against its own bare and detached head. It is, therefore, where it can be felt, an absolute and pathognomonic indication of the presence of dead or carious bone. But it must be remembered that it can usually only be obtained under an anæsthetic, when free movement without pain can be procured. Also it must be distinguished from mere joint crackling, and, lastly, it may not exist, although necrosis is present, for unless there are two bony surfaces exposed, the characteristic feeling will not be obtained, and even where the upper epiphysis of the femur is detached there may be enough epiphysial cartilage or

granulation tissue left on the upper end of the shaft to prevent the genuine bony grate. It is true that even here there will be a roughness or jolting in the movement of the joint which will give us nearly the same information, but it is not so characteristic nor so easy to distinguish from less serious conditions.

Abscess.—The vast majority of cases of hip disease go on to suppuration. A certain number of cases get well by the process of removal of the inflamed end of the bone without suppuration—a *caries sicca*, a *non suppurative osteitis*, as in a good case recorded by Ford; but the greater number by far go on to the formation of pus. Yet of this number by no means all develop abscesses which open and discharge externally. Suppuration within the cavity of the joint takes place and even bursts the capsule, and yet by absorption of the fluid and caseation or removal more slowly of the solid elements, the swelling caused by the abscess may disappear and the case recover. Still I am convinced that nearly every case of chronic disease of the hip, if the joint was examined, would at a certain period of its course be found to contain pus.

When the joint cavity suppurates, the pus may take very various courses after, by absorption of the capsule, it has burst from the joint, but first it may escape from the joint in several different spots, usually I think at the posterior part, sometimes on the inner, sometimes on the outer side; occasionally it finds its way probably through the opening in the front of the capsule through which the branch of the external circumflex artery enters. As soon as the matter has left the joint it usually tends to burrow in one direction or another, not, however, always, for sometimes the relief of the tension diminishes the irritation and for a time pus formation ceases. Usually it tracks among the muscles and takes one of several directions. It may pass forward beneath the rectus femoris and point at the anterior border of the tensor vaginæ femoris; it may travel down the thigh and point at a lower part of the edge of this muscle; it may gravitate backward

and open at the upper or posterior border of the great trochanter, or, farther still, at the lower border of the gluteus maximus; it may reach to the perineum, extend along the adductor tendons and come to the surface at the inner side of the thigh; or, again, it may pierce the skin just at the inner angle of the fold of the groin between the scrotum or labium and the thigh. It may travel up the sheath of the psoas and point above Poupart's ligament, or travelling over the brim of the pelvis may then gravitate downwards and burst into the rectum or the ischio-rectal fossa, or escape through the sciatic notch.* I have records of two cases where pus discharged through the rectum, and I am inclined to think it is commoner than is supposed, and that the disappearance of abscesses about the joint is sometimes to be thus accounted for. A bad result does not necessarily follow, and some cases are probably glandular abscesses not directly connected with the joint; in other instances faecal matter has been discharged into the joint.† Or, again, travelling downwards, pus may find its way to the lower part of the thigh and open in the popliteal space, or by the side of the knee. Lastly, it may burst at different times in any number of these spots. I have the record of a case, kindly lent me by Mr. Lund, in which there were no less than twenty-one different openings.‡ Various attempts have been made to utilise the fact of these many different routes followed by suppuration to gain knowledge of the position of the lesion, but with only partial success.

On the conditions determining the course taken by the pus, Bonnet says: If the head of the femur does not press specially upon any part of the capsule, pus in the joint will make its way out at the inner side where the vessels and nerves pass into the gland of Havers, and this is the weakest spot in the capsule, and that where forced

* Clippingdale thinks that this depends upon whether the abscess escapes behind or in front of the obturator internus; if behind it may open into the rectum, if in front it will point in the groin, while if it travels along the sheath of the muscle the matter appears at the sciatic notch (*vide loc. cit.*).

† *Vide* Pamphlet by Mr. Hardie on *Excision of the Hip*, 1872.

‡ Case 4, Appendix II.

injections burst their way out. In this case the abscess points at the inner side of the thigh among the adductors. If, however, adduction of the limb with rotation outward is present, the head of the femur presses against the anterior and inner part of the capsule and it gives way there; if adduction and inward rotation occur, the matter escapes at the back part. If the abscess opens at the front of the joint, it finds its way into the sheath of the psoas and iliacus, and may travel up into the pelvis or simulate a psoas abscess, or extend downward toward the inner side of the thigh. This abscess he considers very common with fluctuation above and below Poupart's ligament; ordinary experience does not bear out this view of its frequency, though it is certain not very rare. Abscess at the back of the joint may, he says, enter the pelvis along the track of the external rotators,* but commonly points below the gluteus maximus.

He mentions the case of an abscess which opened at the back of the sacrum, and was traced beneath the gluteus through the sciatic notch into the pelvis, thence into the sheath of the psoas, and so to the front of the joint. Erichsen describes abscesses which burst below and in front of the great trochanter as indicative of disease of the femur, while gluteal abscess may be due to disease of either the femur, the acetabulum, or the dorsum ilii, and pubic abscess pointing above Poupart's ligament, he considers due to pelvic disease on its inner aspect.

Barwell thinks that an abscess pointing just below Poupart's ligament indicates perforation of the acetabulum; this, however, is certainly not always so, for as Hancock pointed out, abscess may form within the pelvis without perforation from simple extension of inflammation through the bone, and I have several times, too, seen such a condition from abscess running up the sheath of the psoas, as well as from disease on the outer wall of the pelvis.

From the cases I have watched I think the conclusion

*As in a case I have lately seen.

may be drawn that when an abscess points on the front of the limb above a line drawn through the upper border of the great trochanter, there is disease of the pelvis, and this is the more certain the higher and the more internal the opening. I, of course, exclude superficial abscesses that sometimes occur from glandular suppuration, although, as I have already remarked, they are most commonly affected in pelvic disease. Abscess pointing between the scrotum or labium and the thigh, I always look upon as of serious import, indicating pelvic caries. The peculiar conical projection to be felt on pressure above Poupart's ligament, as pointed out by Barwell, is rather due in my opinion to enlargement of the iliac glands than to periosteal pelvic thickening in the great majority of cases; like thickening to be felt by rectal examination at the site of the acetabulum on the inner wall of the pelvis,* it is to be looked upon as a grave sign and one pointing to marked pelvic disease.† When abscess forms from breaking down of these glands it is often very intractable, just as in tuberculous gland abscesses elsewhere.

Wasting of Limb.—Muscular wasting of the affected limb is an early and prominent condition in hip disease,‡ so early and so rapid that it is, and with good reason, ascribed to the result of trophic nerve changes rather than to mere disuse.¶ The limb in later stages assumes a

* Cazin lays much stress upon rectal examination. *Rev. de Chir.*, March, 1882.

† *Vide* note on page 76.

‡ Brodie remarks that the formation of pus is indicated by aggravation of pain, increased spasm and flexion, constitutional symptoms, and greater wasting.

¶ Barwell points out that the muscles, though atrophied, are tense and not soft, and says that the atrophy is proportionate to the pain, while Nunn goes so far as to say that wasting of muscles precedes the disease.

Brown-Sequard's experiments on "Trophic Lesions" in limbs of which the nerves have been divided, lead him to think that the lesions are the result of irritation of nerves, and independent of "trophic centres;" this may throw some light upon the question of early muscle wasting in joint disease. (*Le Progrès Medical*, March 7, 1885.)

Treves thinks that the flattening of the buttock commonly ascribed to wasting of the glutei may be accounted for simply by flexion of the limb. In this I cannot agree with him; it will account partially, but by no means entirely for it. I believe there is real muscle wasting in the buttock at an early stage, just as in the thigh.

peculiar bulbous look, the thigh and leg are small, thin, and weak, while the hip itself is rounded, swollen, and distended, as compared with the opposite side, and coldness and venous congestion are commonly present, with often œdema of the foot from venous or lymphatic obstruction. The bone, too, undergoes a great amount of atrophy, the denser layer is thinned, and the spaces of the cancellous tissue enlarged, so that the bone becomes diminished both in diameter and strength. Such is the condition which has in several cases led to fracture of the bone in attempts at thrusting the upper extremity out of the wound in the operation of excision, and is a fact to be remembered in the forcible straightening of the limb (*vide* case 17).

Arrest of growth under such circumstances is to be expected and does occur, but to a much less extent than would be imagined, as will be seen in the section on results of excision.

Outline of Region of Hip.—Two points are always described in connection with disease of the hip as being characteristic of it—loss of the fold of the groin, and flattening and widening of the buttock with lowering and partial obliteration of its fold. These conditions are worth noting, although they are not always present, nor always characteristic of hip disease when they are so. (Compare also the section on swelling.) The fold of the groin is most completely obliterated when the limb is abducted and rotated out, especially if there is also swelling of the front of the joint or glandular enlargement. On the other hand, the fold is exaggerated in adduction and rotation inwards; in this position in girls the labium will be compressed, flattened, and partially or entirely hidden. It is not always easy at first sight to tell by mere inspection which is the diseased limb. I have seen two children standing side by side in exactly the same attitude, and yet they had disease of opposite sides. Lowering, flattening, and widening of the buttock may be the result produced by actual wasting, or partly by relaxation of the gluteal

muscles which by their flaccidity give rise to this appearance as compared with the other side. Abduction and outward rotation help to produce the flattening. The opposite extreme is where, from great adduction and inward rotation, the lower and central part of the buttock is very prominent, and at the same time, from the presence of abscess or inflammatory thickening, rounded.

It must be remembered that, as Brodie pointed out, in dislocation there is flattening and widening of the buttock, and a less-marked condition results from the pseudo-dislocation of the late third stage (*Fig. 40*).

Barwell attributes the flattening of the buttock to the diminished prominence of the tuber ischii from thrusting forward of the pelvis in the later stages of the disease, this, of course, acting in conjunction with wasting of muscles which produces flattening in the earlier periods.

The *rima natium*, too, he points out, is inclined upwards and towards the diseased side, which is simply the appearance produced by lowering of the buttock in the second stage, in the third it of course takes the opposite direction (*Fig. 40*). All these appearances, together with spinal curvature, may, he says, be simulated by other conditions which do not, however, show the filling up of the post trochanteric fossa upon which he lays stress.

Ford describes a case in which there was contraction of the upper opening of the pelvis from curvature of the sacrum as a result of hip disease.

Dislocation and Shortening.—The older writers on hip disease spoke of dislocation* as one of the common results of the destruction of the joint. Probably they were misled, in the absence of actual dissection, by the shortening, adduction, and inversion of the limb which occurs in the third stage.

As a matter of fact it is probable that without injury true dislocation of the head of the femur out of the ace-

* Thus Hippocrates, Asclepiades, and Galen, as well as others, wrote of dislocation from disease.

tabulum very rarely occurs. Several conditions may exist and give rise to the appearance of dislocation. First, the head of the femur being entirely destroyed, the truncated upper end of the bone is drawn upwards by the muscles attached to the trochanters, so that the upper border of the great trochanter rises above Nélaton's line; here, as the head of the bone no longer exists, true dislocation can hardly be said to have occurred (*Fig. 40*). In other cases the rim of the acetabulum is destroyed, and the head of the femur, which is also more or less eroded, is then drawn upward by muscular action; here there may be, but usually is not any, new bone formation around the acetabulum; this constitutes the so-called "travelling acetabulum" or "dislocation of the acetabulum" (Sayre). Other instances again occur where the floor of the acetabulum is perforated, and the upper end of the bone projects through the perforation into the cavity of the pelvis, or rather into the space between the inner surface of the acetabulum and the thickened pelvic tissues. In certain cases the upper epiphysis of the femur is left behind in the acetabulum and the shaft is drawn upward, and usually backward on to the dorsum.

The first of these conditions is by far the most common, and is especially likely to occur when with great destruction of bone is combined much adduction and rotation inwards; here there is a greater strain thrown upon the softened capsule, which either gives way or becomes stripped off the margin of the acetabulum, so that the end of the bone is not really outside the capsule but is still invested by it, or rather what remains of it; this fact was described by Brodie, though he seems to have considered it a dislocation, and describes it as such.

There is no doubt that in a few cases of advanced hip disease some slight injury or strain has caused the head of the bone or its remains to be displaced, usually on to the dorsum, but sometimes on to the pubes, as in a case of Brodie's and another case which was verified post mortem by A. Cocchi, in 1754. Portal records three

cases into the obturator foramen from disease. Bonnet, however, who quotes him, throws some doubts upon his observations. Humbert de Morley is also cited by Bonnet as having reduced by gradual means eight cases of dislocation from disease with good results. Bonnet reduced one but it recurred; he recommends gradual reduction by extension. De Morley's cases were probably merely instances of extreme adduction. Erichsen thinks that, in addition to the causes mentioned above, the head of the bone may be pushed out of the acetabulum by a "fungous fibro-plastic mass" in that cavity; he says it may occur without suppuration, and in that case a new joint may be developed, while if pus is formed, no attempt at new formation of a joint will be found.

The conditions in which dislocation, so called, may occur are described somewhat differently by different writers.

Brodie says that synovitis may sometimes end in dislocation, apparently from softening and destruction of the capsular ligament (*vide* case 11, Brodie).

Bonnet observes that in abduction there is a tendency to obturator dislocation, while adduction and rotation inwards tends to result in dislocation upon the ilium and absorption of the upper and outer part of the acetabulum.

March (of Albany) and Sayre altogether deny the occurrence of dislocation except possibly as an extreme rarity (*vide* Lund's case).

Barwell lays stress on the organic shortening or contracture of muscles produced by cicatricial changes in their fibrous rather than their muscular elements, which render their recovery impossible, and hence prevent the restoration of the limb to its former length. He quotes Liston and Bauer as to the rarity of true dislocation, and says he has seen two cases, in both of which the malposition of the pelvis had diminished and so the apparent shortening was less.

Holmes mentions a case where by mere distension of the capsule with rupture of the ligamentum teres, but no suppuration or disease of bone, dislocation occurred. Dr.

Hueter, quoted by Holmes, describes four conditions causing displacement of the trochanter upward: "Separation of the epiphysis, and a sort of fracture of the neck of the bone;" "enlargement of the acetabulum;" "subluxation;" "true pathological dislocation." He (Hueter) believes the neck of the femur very commonly lengthens as the result of inflammation, and the head of the bone may be detached from the shaft and united to the acetabulum by fibrous tissue or cartilage without necrosis.

Mr. Holmes is satisfied of the occurrence of this elongation of the neck, otherwise I should have been inclined to attribute the projection of the trochanter, by which it is characterised, as due to pushing outward of the head of the bone by effusion or granulation tissue within the joint.

Cæsar Hawkins excised one case where the head of the bone lay on the dorsum ilii immediately under the skin, and Mr. Holmes mentions another case in St. George's Hospital Museum where the head lies just beneath the anterior superior spine.

I have in one instance found the head of the femur superficially almost unaltered, lying upon the upper rim of the acetabulum, the limb being adducted and rotated inwards. In another instance I found and reduced a dislocation of the hip from disease, but acute mischief necessitated subsequent incision and excision with a fatal result (cases 79 and 94). I have also had under my care a remarkable case of obturator dislocation, coming on gradually as the result of strain and ligamentous softening; the dislocation was reduced and the joint is now quiescent, though it has not regained its mobility.

Stages of the Disease, and Position of the Limb.—It is usual and convenient, for descriptive purposes, to divide hip disease into three stages, a plan first adopted, I believe, by Ford in 1810. He described the first stage as beginning with the first appearance of the disease and ending at the "period of lengthening." His second stage extended from the time of lengthening to the onset of shortening, and his third stage from this to the end of the disease.

Boyer and Maissonneuve describe only two stages, the first from the beginning of the disease to the development of "dislocation," and the second from this time till the end.

Rust takes four stages: One, commencement; two, lengthening; three, shortening; four, suppuration.

Chelius takes three stages, identical with Rust's first three.

Barwell prefers Ford's division.

Boyer's classification is incorrect and does not seem to serve any useful purpose.

Rust's plan does not correspond to the history of the disease in that shortening and external suppuration so frequently coincide in point of time.

On the whole, Ford's classification seems to be the most useful of those proposed, yet the more desirable plan would be one that gave information as to the condition of the joint. I would suggest that a classification practically identical with Mr. Adams' should be employed, viz.: First stage, from the onset to the development of pus within the joint—the period of flexion. Second stage, from the end of the first until the formation of abscess outside the joint—the period of abduction. Third stage, from the second to the end—the period of adduction or shortening. These correspond to (1) the stage of bone mischief alone, (2) extension to the joint, (3) destruction of the capsule and external abscess.

The period of suppuration is, I believe, indicated most certainly and most early by *thickening of the great trochanter*.* The trochanter should be grasped between the finger and thumb and compared with that of the opposite side; if thickening is present, it will, I believe, with one or two exceptions, be always found that there is pus in the joint. The exceptions are cases where abscess from some other cause, *e.g.*, spinal, sacro-iliac or pelvic disease, has burrowed down around the trochanter and cases of

* Barwell lays special stress upon the thickening felt on grasping the head and neck of the bone. I prefer to take thickening of the trochanter, but it is practically nearly the same thing.

disease of the upper end of the femur, trochanter, etc., outside the joint.

It must, however, be remembered that extensive disease with necrosis may exist without any external abscess, and, indeed, without any actual collection of pus being found in the joint. I have more than once excised the joint and found this condition (*vide* case 84).

These cases may be compared with the "quiet necrosis" of Paget, and the cases recorded by Mr. Morrant Baker of non-suppurative necrosis of the femur.

A very great amount of thickening usually means pelvic disease, and often sequestra will be found where it is very pronounced. In slight degrees, *i.e.*, in early disease, the child should lie upon its face, and the trochanters of the two sides be grasped one between each forefinger and thumb, and careful comparison made as to breadth and blurring of outline of the two processes.

Given, a case of hip disease, so far as I know, trochanteric thickening with rounding and blurring of its outlines, is the only single sure indication of the presence of pus in the joint.

As regards lengthening of the limb, although Bonnet was the first to make elaborate researches on the question in 1845, Brodie had, in 1836, already pointed out that pressure within the joint could not produce lengthening, but would tend only to push the head of the bone outwards, a fact verified by Mr. Barwell's later researches and experiments.

Bonnet, by injecting the hip joint with coagulating material, showed that the hip has a larger capacity during semiflexion and abduction than in any other position, and that when it is filled by a forced injection it tends to assume this position; it is true that other observers have not always succeeded in obtaining the same results, still I think he fairly proves his point.

He showed, too, that the capsule is most rigid in front and externally, and most distensible below, behind, and internally, and that the head of the bone is furthest separated from the acetabulum in flexion and abduction. The

first of these statements is, of course, an easily verified fact and is obvious; the second is more doubtful; the amount of separation of the head from the acetabulum is, at most, exceedingly small, under any circumstances, in a healthy joint; as soon, however, as by softening of ligaments and effusion the structures become more yielding, no doubt the head is more easily and more widely separable.

Bonnet, too, points out a fact, which is an important one, that full extension is never seen in hip disease; this I believe to be strictly true. I do not, however, think that abduction is necessarily or always accompanied by outward rotation; there certainly may be no rotation. Abduction, again, is no doubt more common than adduction in the earlier stages, but is far from being universal. Sayre considers eversion the most characteristic point in the second stage, but I cannot agree with him.

Bonnet concludes that accumulation of fluid in the joint tends to cause abduction and flexion; he, however, modifies his statement, and I think wisely, by saying that the posture assumed by the patient has much to do with the fixed position of the limb. If the child lies on its back, there will be simply direct flexion; if he inclines to the sound side, there will be flexion and adduction; if to the diseased side, flexion and abduction. He explains adduction by saying that in an earlier stage the limb was abducted, but when the fluid escaped from the joint cavity adduction took place, and further suggests that disease affecting the inner part of the joint may produce adduction in consequence of the relief afforded by thus relaxing the inner part of the capsule. The adduction occurring in the later stages is commonly attributed to loss of power in the abductor muscles, or—a much more reasonable view, though not entirely an adequate one—to bursting of the capsule of the joint.

Gross states that the foot may look either outward or inward in the third stage, though he allows that it is most usually directed inward; he attributes it in some cases to destruction of the acetabulum, which causes the limb to

assume the position of an iliac dislocation, while eversion results if there is much destruction of the femur.* I do not think these views will be generally accepted. It is not very rare to find the position of the limb reversed in the second and third stages, and if previous treatment has been adopted by splints, extension, etc., almost any position of the limb may be assumed. My own belief is that position depends upon, first, the distension of the joint; secondly, upon the position in which the patient lies or has been placed for purposes of treatment; thirdly, upon the drawing up of the femur when the head and capsule have been destroyed in the later stages.

The explanation of apparent lengthening by tilting of the pelvis to allow the foot to reach the ground, and the converse tilting in adduction, is somewhat over-strained. In many cases attempts at walking are much too painful to admit such a theory.†

Lordosis, or curvature of the lumbar spine forward with throwing back of the upper part of the spinal column, is clearly purely a result of flexion, and has nothing to do with any other movement (*Figs. 36 and 37*). As the thigh is flexed upon the pelvis, in order to bring the limbs together, the pelvis must tilt forward; this tilting takes place in the lumbar region, and this again tends to throw the centre of gravity of the body outside the vertical line, and must, therefore, to enable the patient to maintain his equilibrium,† be counteracted by a corresponding amount of backward arching of the trunk above the lumbar region; hence we see the varying amounts of lordosis directly proportionate to the amount of flexion of the thigh upon the pelvis.

Flexion and abduction, combined, produce a mixed curvature of the spine, lordosis plus a lateral curve, the concavity of which in the lumbar region looks toward the

* This variability in position of the foot is sometimes due to rotation at the ankle and tarsal joints. There may be adduction and rotation in of the thigh, and rotation out of the foot.

† Thomas appears to have been the first to recognise this view. The pelvic tilting, whether in flexion, abduction, or adduction, is to avoid the inconvenience of want of parallelism, and occurs whether the child is up or in bed.

diseased side, with corresponding prominence of hip and shoulder on the opposite side.

Bonnet alleges that, from lying in bed with abduction and rotation outwards, the leg rests upon the ankle, and the knee is unsupported; hence there is a tendency not only to produce pain in the knee, but also a dislocation of the knee backward and outward. This I cannot verify from my own experience, but it is possible that it may have been more frequent in the times when hip disease was less early treated by extension and the limb was allowed to assume any position it liked.

Where adduction occurs, as Bonnet points out, the spinal curvature is the reverse of that in abduction, and the strain upon the knee is also reversed—*i.e.*, the tibia may become displaced inward.

Where there is apparent lengthening, the diseased limb is flexed, abducted, and rotated out, and the sound leg is directed parallel to it. In this condition the pelvis is tilted downward and forward toward the diseased side. Bonnet claims to have been the first to describe this alteration of the normal position, though he acknowledges that Hunter, Brodie, Guerin, Samuel Cooper, and others had noted the lateral tilting of the pelvis before his time (*Figs. 38 and 39*).

Various explanations had been given by earlier authors of the lengthening supposed actually to exist; thus, it had been attributed to the collection of fluid within the joint, to swelling of the Haversian gland, to swelling of the cartilages, to swelling of the head of the femur, or simply to relaxation of the muscles. No serious refutation of these ideas is necessary, except in the case of the supposed effects of accumulation of fluid within the joints, and this has been amply disproved, as already pointed out, by Mr. Barwell and others. Mr. Barwell, by means of needles driven into the anterior and inferior spine of the ilium and into the femur, showed that no lengthening of the limb whatever was produced as measured by increase of the distance between the two needles if the head of the femur was prised away from the acetabulum, but that the

only effect was to make the great trochanter on that side more prominent. It is now a nearly universally recognised fact that no lengthening occurs as a result of hip disease; it is well, however, to bear in mind the possibility of a diseased limb being congenitally longer than the sound one, or the possibility of an abnormal growth of the diseased femur; of this I have seen an instance. It must be further noted that Mr. Erichsen still asserts

FIG. 38.



Shows the position assumed in the second stage of hip disease. Flexion, abduction, rotation outwards, apparent lengthening. Right hip disease.

FIG. 39.



A side view of figure 38.

that in "acute arthritic disease" actual lengthening may occur from effusion. (It is, I suppose, just possible that a slight amount might occur from relaxation of ligaments.) It is, too, necessary to be aware of the fact that in adduction the limb measured from the anterior superior spine to the internal malleolus is longer than in abduction, for the *crista ilii* in abduction actually approaches nearer the trochanter than is the case when the limb is straight;

hence, in cases of apparent lengthening, there is really a minute amount of actual shortening. Mr. Barwell, I believe, was the first to observe this point.

Mr. Holmes has noticed that apparent shortening due to raising of the pelvis on the affected side is common, and not always consecutive to apparent lengthening; this I have also seen, but it merely amounts to saying that adduction may occur as has already been pointed out.

Martin and Collineau, as quoted by Mr. Holmes, describe a "capsular coxalgia," where inflammation of the capsule is accompanied by (? results in) relaxation of the ligaments, which produces abduction and rotation out, or rather necessarily involves that position in consequence of the anatomical arrangement of the fibres of the capsule, and so the muscles put the limb in that position.

Secondarily to this, they say, the pelvis falls, and so lengthening occurs, while after a time the inflamed capsule contracts and hardens, and drawing up the bone produces shortening. They further attribute the shortening, adduction and rotation inward, to muscular spasm, the result of joint irritation from "coxalgic osteitis," or inflammation of the femur and acetabulum, and so explain early shortening in cases of primary osteitis.

Apparent lengthening, then, is due to a lowering and throwing forward of the pelvis on the affected side. The apparent shortening, on the other hand, to the pelvis being raised and thrown behind the sound side. Or, to take the same fact in another way, the apparently lengthened limb is flexed and abducted, the apparently shortened limb is flexed and adducted, the two conditions being usually, but not always, associated with rotation outward and inward, respectively.

Mr. Howard Marsh warns us against the liability to fallacy involved in the ordinary measurement from the anterior superior spine, not only on account of the mobility of the skin, but because the anterior superior spine is not the centre of the arc of motion, and so a little flexion will cause apparent shortening. He advises that the two limbs

should be put in corresponding positions, and the measurements corrected by the eye; his advice is, no doubt, sound. I would here note a further source of fallacy by which we may be misled, and this is, that in cases where there is much thickening around the great trochanter, the level of the upper border of the trochanter may be raised to the extent of more than half an inch, and hence Nélaton's test

FIG. 40.



Late stage of hip disease, showing both real and apparent shortening. The outline of the buttock, wasting of the limb, and direction of the *rima natium* are also seen.

may lead to false conclusions. In the earliest period of the disease, before the conditions just discussed have developed, the limb is always slightly flexed; I do not think it is ever fully extended, though it is possible to put it nearly in that position. Erichsen points out that in this stage the patient usually walks upon the toes, which he explains by saying that it is an attempt to prevent the transmission of the jar or shock of impact with the ground

through the heel to the hip. More probably the flexion and functional shortening is the cause.

To sum up. Taking the usual classification of the course of the disease into the three stages of Ford, the position assumed successively by the limb will be—in the first stage, flexion to a variable degree, with or without slight abduction, and possibly rotation outward; in the second stage, flexion usually well marked, with abduction usually, and rotation outward, producing apparent lengthening (*Figs. 38 and 39*); sometimes, however, there is adduction, and sometimes mere flexion, with no rotation, or with rotation inward; in the third stage, there is always flexion, and most commonly adduction and rotation inward (*Fig. 40*), with apparent or real shortening, but there may be abduction and rotation outward. Thus position, though a valuable, is not an absolute guide, and requires to be checked by the other symptoms present.

FIG. 41.



Shows one of the positions assumed in double hip disease. There is extreme lordosis, actual shortening from displacement, and some rotation. The way in which the right leg overrides the left suggests a possible development of "scissor-legged deformity" (Lucas) later.

Scissor-legged Deformity after Hip Disease.—Mr. Lucas,* Dr. Tyson of Folkestone, and others have recorded cases where, as a result of double hip disease, a peculiar “cross-legged or scissor-legged deformity” occurs; both legs are adducted, the one in front of the other, and progression takes place entirely by movement at the knee joint. It is easy to understand the condition by simply walking with the knees crossed over one another. It occurs, according to Mr. Lucas, in cases where disease has occurred first in one joint, resulting in adduction, and then subsequently in the other joint. Other deformities may result from the same condition (vide *Fig. 41* and case 74, and case 13, Appendix ii.; vide also p. 120).

* *Clin. Soc. Trans.*, 1881.

CHAPTER V.

DIAGNOSIS.

THE diagnosis of disease of the hip is as difficult in some cases as it is easy in others. In well-marked cases where the disease is advanced it usually is quite readily diagnosed, while on the other hand, few diseases are so closely simulated by a large number of other affections as that of the hip, and the variety of symptoms that it presents is in itself a fruitful source of mistake. It will, perhaps, most conduce to a clear understanding of the subject if I first tabulate the diseases for which hip disease may be taken, and the list is not a short one.

1. Chronic rheumatic arthritis, including "*arthrite sèche*," osteo-arthritis, and chronic rheumatism under this term.*
2. Acute rheumatism.
3. Hydrops articuli described by Bonnet.
4. Bursitis of the psoas or one of the gluteal bursæ.
5. Ostitis or periostitis of the great trochanter.
6. Periostitis of the upper end of the femur.
7. Sacro-iliac disease.
8. Psoas abscess.
9. Iliac abscess.
10. Gluteal abscess, traumatic or spinal.
11. Abscess connected with disease of the pelvis.
12. Perityphlitic abscess, suppuration around the sigmoid flexure of the colon, pelvic glandular abscess or chronic adenitis.

* These are unlikely to be met with in children, though chronic rheumatic arthritis does exceptionally occur during childhood.

13. Superficial abscess, glandular or other, and deep abscess around the joint.
14. Infantile paralysis.
15. Spastic paraplegia.
16. Sprains or old dislocations, or fractures of the neck of the femur or trochanter.*
17. Syphilitic synovitis or telostitis.
18. Interstitial absorption of bone, usually traumatic* (*vide* case 14, Appendix ii., and p. 131).
19. Hysteria.
20. New growths involving the upper end of the bone or its neighbourhood.
21. Sciatica.*
22. "Congenital dislocation" of the hip, or other congenital conditions.
23. Rickets.
24. Disease of the knee.
25. Lateral curvature of the spine.
26. "Diastasis," or separation of the upper epiphysis of the femur (Sayre), has been supposed to occur occasionally, and may possibly account for those cases in which the entire epiphysis is thrown off as a sequestrum almost unaltered in appearance (*vide* case 12 and *Fig.* 18).

In addition, the special form of hip disease so often associated with pyæmia, and known as "acute suppurative arthritis of infants," which has been so well described by Mr. Thomas Smith. Of these, of course, only those affections to which children are liable will be considered in the present work. Of these I will select only a few of the rarer or less obvious, or of the more important diseases, the rest being sufficiently readily distinguishable.

Inflammation of the psoas bursa is a rare affection which simulates hip disease by flexion of the joint, pain and fulness over the front of the articulation, and impaired mobility; it is distinguished by the absence of pain, or tenderness, or swelling at the back of the joint, and by

* These are unlikely to be met with in children.

movements of abduction and rotation being painless when the limb is flexed as well as by absence of startings or thickening of the trochanter.

Inflammation of the gluteal bursæ, of which that between the gluteus maximus and the great trochanter is the most common. In this case a large gluteal abscess may be mistaken for abscess connected with the joint, or if the abscess has burst the long track left may lead upwards, and be indistinguishable from one communicating with the joint; the absence of shortening, of adduction, or of grating on movement of the joint, which will also move freely, absence of pain on jarring or pressure, and of fulness in front of and behind the joint, are additional points. This condition has been commented on by Mr. Teale, of Leeds, in the *Lancet* for 1870.

Disease of the great trochanter is more difficult to distinguish, and it must be remembered that the inflammation may extend from the shaft to the joint, as in the following case:

Case.—Annie P. was healthy till she was ten years old; she then had acute periostitis of the femur, the swelling extended from the hip to the knee, abscesses then formed and discharged about the knee, and some bone came away. Later an abscess appeared near the hip, which burst, and from it the head of the bone was discharged. The sinuses finally healed eight years after, leaving her with a flexed knee.

Here clearly the disease began as a periostitis, which involved the hip joint secondarily, and probably by extension of the disease the epiphysial cartilage was destroyed, and the head of the bone separated. This case, so far, resembles a case of Mr. Bryant's of destruction of the greater part of the shaft and the head of the bone; in this instance a movable limb resulted. On this subject, as well as many others in connection with hip disease, Dr. Gibney's valuable book gives us information. It should be remembered that a central bone lesion may cause perforation of the compact tissue beyond the limits of the capsule, and so

not implicate the joint cavity; this is, I think, the explanation probably of an interesting case of Dr. Gibney's (*vide* p. 296 of his work).

Although in trochanteric disease sinuses may exist in the same positions in which they are often found in morbus coxæ, the smoothness and freedom from grating, as well as the wide range of mobility of the joint, will serve to distinguish between the two; other abscesses in the neighbourhood of the joint are recognised by their history, which is usually too short for chronic hip disease, and not acute enough or sufficiently severe for acute joint inflammation. They are also recognisable by the freedom and smoothness of the movements of the joint through a certain range, even though that range may be a limited one. Absence of pain and tenderness in some part of the joint circumference will be contributory evidence.

Infantile paralysis simulates hip disease in the lameness to which it gives rise, but is distinguished from it by the absence of pain and swelling, and especially by *freedom of mobility*, and by an amount of wasting and coldness of the limb disproportionate to the other symptoms, as well as by the history of the disease; it is, however, worth noting that in the *British Medical Journal* for 1877, Mr. Savory records a case of acute hip disease in a leg affected by infantile paralysis.

Spastic paraplegia can only be mistaken for double hip disease and resembles it only in the loss of mobility.

Old injuries in the neighbourhood of joints leave stiffness and deformity, either too great or too slight for the accompanying evidence of inflammation, and a history can generally be obtained incompatible with joint disease.

Syphilitic disease is distinguished by other evidences of syphilis, by the slight tendency there is to suppuration, and by its amenability to mercurial or iodide treatment. I have, however, seen chronic hip disease in a congenitally syphilitic child (*vide* also p. 130).

Interstitial absorption of bone generally occurs too

painlessly to be mistaken for hip disease of the common type, nor is there tendency to suppuration in this affection.*

Sacro-iliac disease and psoas abscess may both simulate hip disease in the position in which they give rise to pain, and in flexion of the joint; it is, however, only necessary to examine the spine and sacro-iliac articulations to find in most cases symptoms incompatible with disease of the hip, while in simple psoitis flexion and inward rotation are free.

It must be remembered, at the same time, that the abscess within the psoas sheath, resulting from either of these diseases, may open into the hip joint, and so a secondary hip disease may be developed. It is not, I believe, very rare for psoas abscess to do so; and although I have only had one opportunity of verifying the fact post mortem, I have several times believed such to be the case. In 1872, Mr. Gay excised a hip in a man aged twenty-seven years, where the disease was secondary to spinal caries; he removed the trochanter and a sequestrum; the man died seventeen days later. Spinal caries and hip disease may, of course, coexist independently of each other, and this is not rare. It is sometimes impossible to be sure that disease of the hip does not exist where an iliac or psoas abscess has burrowed down and surrounds the hip joint on all sides; the symptoms are then often identical, and only the discovery of the spinal or iliac disease can clear up the case. In other instances free mobility of the joint through a certain range in all directions excludes hip disease. Rectal examination enables us to distinguish between hip disease and spinal gluteal abscess, since in the latter the abscess can be felt to extend upwards over the brim of the pelvis.

Of sacro-iliac disease extending to the hip joint I have not seen an instance, though I am informed by my friend Mr. E. H. Howlett, of Hull, that he has once, if not twice, seen this condition, and the converse lesion extending from the hip to the sacro-iliac joint is illustrated among my own specimens.

* *Vide* case 14, Appendix ii.

Abdominal abscess I have seen very closely simulating hip disease, as in the following case: John Ernest J., aged five and a half, admitted April 11th, 1881, discharged July 27th, 1881. Elder brother has diseased ankle.

History of Disease.—Four days before admission, stooped in walking, two days later had pain in both hips. The left thigh became drawn up; he cried in his sleep.

Condition on Admission.—Lies on left side. Both knees flexed. Movement of right leg unrestrained and painless. Left thigh semiflexed, partially abducted. Passive movement resisted. Great tenderness all about left thigh and increased heat. No tenderness or curvature of spine. No swelling anywhere.

Treatment.—Extension which brought the limb down and relieved the pain. May 7th an abscess suddenly appeared below the anterior superior spine of the ilium. This was opened antiseptically and a drainage tube eight inches long passed upwards from it, the wound was dressed with salicylic silk.

Did well. June 4th, free mobility.

Result.—July 24th, quite healed; little or no limitation of movement; no tenderness.

Abscess connected with the cæcum, or sigmoid flexure, is not uncommonly mistaken for hip disease. Such cases closely resemble iliac abscesses from other causes, with the addition of symptoms indicating connection with or proximity to the large bowel.*

Had I not known of three instances in adults, in which the question of diagnosis between a malignant growth of the upper end of the femur and hip disease was difficult to decide, I should have said that it was hardly worth while to point out the distinctions between them. It is here sufficient to point out the diagnostic signs between the two. The absence of distinct abscess, and of adduction or any marked amount of flexion, are the points leaning against hip disease; while pain, swelling, some rise of

* *Vide* Paper "On some forms of Abdominal Abscess occurring in Children," by the writer, in *Archives of Pediatrics*, 1884.

temperature, slight flexion, marked shortening, and grating may all exist in a case of central sarcoma of the neck of the femur, as in one of the cases referred to, and the presence of the growth may set up secondary inflammatory changes in the joint, and make the diagnosis very difficult. In this case probably there would have been more characteristic deformity had not the spontaneous fracture prevented the abductors, etc., from coming into play.

Congenital atrophy of the femur is not likely to be mistaken for recent disease, but may, perhaps, be a result of intra-uterine affection of the joint.

One of the commoner sources of error is enlargement of the iliac or of the inguinal glands; pain, lameness, flexion and some rigidity of the joint are found; on examination by deep pressure above Poupart's ligament the enlarged glands may be felt and palpation is painful; careful search, however, will show rigidity only in extension or slightly in abduction as well, while flexion, adduction, and rotation are free, there is no trochanteric thickening and no evidence of effusion into the joint. It must be remembered that the glandular enlargement may be due to hip disease itself.

Others of this long list are readily excluded in most cases by a little trouble, for example, the age of the patient will often enable us to negative the possibility of certain of these diseases. Thus children very rarely get chronic rheumatic arthritis, while acute rickets is not met with in adults.

It is, however, always well to use the "method of exclusion" in doubtful cases, and to bear in mind that there is no one symptom pathognomonic of hip disease, but that, as in other morbid conditions, several factors have to be taken into account in forming a diagnosis. *Free, smooth, painless mobility is perhaps the most satisfactory evidence of the absence of hip disease.*

Thomas' diagnostic method, so-called, is simply the examination of the joint to ascertain if there is flexion or fixation, and his means of estimating the duration of the disease cannot distinguish between acute and chronic conditions.

The sound limb is held flexed to the fullest extent possible; if now the affected limb is extended, lordosis appears, or resistance to extension is felt (*Figs. 36 and 37*).

To sum up the diagnostic points of hip disease. A patient who is a child, who walks lame, especially after a little exercise, who has thickening of the trochanter, some tenderness on pressure over the hip joint and pain together with slight flexion and some immobility of the joint, without evidence of spinal or sacro-iliac disease or pain in any part higher than the hip, and in whom pain is increased by abduction or rotation inwards, has got disease of the hip. I would here lay stress upon the fact that there is not the smallest necessity for hurting a child in an examination for hip disease. It is true that pressure upon the trochanter or heel, what is expressively called by American surgeons "crowding the joint surfaces together," gives rise to pain in disease of the joint, but it is neither a necessary nor a pathognomonic sign.* Night starting is a valuable, but not a constant nor always trustworthy symptom. Later in the disease the problem is usually easily solved, but not always, for as indicated above, disease of the trochanter or abscess around the joint may simulate it very closely, as well as bursitis; in such cases the position and swelling of hip disease, as well as its rigidity, are very closely simulated, and we must rely on other points. Such conditions can, however, only be mistaken for the later stages of the disease, in which there will be shortening of the limb, raising of the trochanter, and probably grating in the joint if examination is made under chloroform. It is only occasionally that we see a child in quite the first stage before the mischief has reached the surface of the bone; in such case, pain, lameness, slight flexion and slight rigidity are the principal signs. Usually the patient is brought in the early second stage when trochanteric blurring is found.

* *Vide infra*, p. 78.

Chronic disease in adults does not differ markedly from that of children in its symptoms, but is usually slower in development, and the health not unfrequently suffers more.

Synovitis may be diagnosed, according to Barwell, by tenderness on pressure over the joint, but not on pressing the trochanter towards the acetabulum. In this I cannot agree with him, and I think that pressure over the front of the joint is not by any means a trustworthy indication, unless pressure on the trochanter also gives rise to pain, for we must remember that we are very likely to press upon a nerve trunk or possibly a tender gland in front, and may be misled by it.

Believing, as I do, that chronic hip disease begins invariably, or nearly so, as an ostitis, I cannot follow Barwell's distinctions in the diagnosis of this condition from synovitis. I do, however, think that *acute* synovitis can be distinguished from the early stages of true hip disease by the greater pain on movement of the joint, with absence of trochanteric thickening, and under chloroform free and perfect mobility in the former; there may be also swelling in front of the joint, but this depends upon the amount of the effusion. In simple traumatic synovitis the mischief immediately follows the injury, while in the bone lesion there is usually an interval of two or three weeks, or often months, between the accident and the onset of symptoms; thus the child falls, cries for a few minutes, but is then well again, and in a month's time begins to limp. This evidence of the history is most important. Careful enquiry should always be made in every case for any previous trouble about the hip since the acute symptoms may be grafted upon old latent disease.

Acute osteomyelitis is readily diagnosed; great constitutional disturbance, fever and prostration, great pain amounting to agony on the least movement, *helplessness of the limb*, rapid and extensive swelling with venous turgidity make the diagnosis easy.

Diagnosis of the Nature and Stage of the Disease.—I cannot do better than summarise Mr. Macnamara's views on the diagnosis of the kind of disease present, and I may say that my own experience largely accords with his. He says that after an injury, excessive pain coming on within fourteen days, with distension of the joint, is probably due to either acute epiphysitis or synovitis, the former not often in children over five, and the disease is attended by considerable constitutional disturbance and signs of suppuration.

Acute traumatic synovitis, he says, generally sets in within a few days—I would say at once—with much pain but seldom high fever, without rigors or much local heat; sometimes, indeed often, the local heat is considerable, but with great tenderness and rigidity. If the disease begins with no very definite symptoms, lameness, slight pain, pain on deep pressure, and resistance to free rotation, the case is probably one of osteomyelitis (tubercular), especially if the patient is scrofulous.

Mr. Howard Marsh, in his valuable paper in the *British Medical Journal* for 1877, gives us most useful information on the diagnosis of hip disease. Thus, he points out that though flexion may be free in some cases, the flexed limb is carried into abduction and not straight up towards the abdomen; again, flexion may be limited in cases of gluteal, or extension in cases of psoas abscess, but in hip disease both are limited in their more extreme degrees, even if free in part of the range of mobility. His caution as to the dangers of frightening the muscles into spasm is also well worth remembering. Rectal examination for thickening of the inner wall of the acetabulum I have seldom found of much value, for it is marked only where the disease is far advanced.*

* While correcting these proofs I have met with a case in which there was a periarticular abscess in the thigh, and examination per rectum revealed a large swelling on the inner surface of the acetabulum, which was emptied of pus, by gouging through the innominate bone behind the hip joint, which was opened and found healthy.

Barwell speaks of a neutral period between the second and third stages of the disease, and considers that it corresponds to the bursting of the capsule after its distension; it will, therefore, correspond to the time during which matter having escaped from the joint is making its way to the surface; there is no doubt that in many cases after a period of considerable pain relief follows, and we later find an abscess, and it is well to be aware of this and not be deceived into thinking the disease is subsiding.* In most cases, however, there is no distinct line to be drawn, especially where the symptoms are chronic throughout, and the position of the child may be that of the second stage and yet there may be sinuses or a large abscess. Sayre records a case where the transition from the second stage to the third—*i.e.*, from abduction to adduction—took place in one night, but the case gives rise to suspicion of its being a traumatic dislocation of a diseased hip.† Although the division into stages is convenient, I do not think it is wise to push it too far, and we can hardly expect the progress of morbid action to follow always a definite course. Adams lays stress upon the fact that hectic, startings, and malpositions with local heat, tenderness, and swelling may all subside with extension, and do not necessarily involve suppuration. This, I think, applies only to synovitis coming on acutely, or to acute attacks of inflammation coming on in the course of the chronic disease; in the case of synovitis, rest and extension may, and probably will, cure the disease, but where there is ostitis already existing, the relief will be only temporary, and any use of the limb will light up inflammation anew.

I have already described what I believe to be the most important factor in distinguishing the actual condition of the joint. During the period of pure osteomyelitis there is no external swelling; thickening of the trochanter indicates pus in the joint; external swelling means rupture of the capsule.

* Mr. Adams alludes to the same fact.

† *Vide* case 34.

I would here again deprecate the use of any of the means of diagnosis which necessitate giving pain to the patient. Although I have mentioned the various plans of eliciting pain in disease of the joint, I believe that it is hardly ever necessary to employ them; the presence of disease is recognisable by the painless mode of examination in all cases where it can be made out at all.

In all cases examination for hip disease should be made with the child completely stripped, and lying on a *flat hard* couch or table.

CHAPTER VI.

PROGNOSIS AND RELAPSES.

As regards prognosis and the results of the disease when treated by means other than operation, it is necessary to distinguish clearly between the two morbid conditions of synovitis (acute) and osteomyelitis, acute or chronic; and here again the difficulty arises of reconciling the opinions of various writers who hold different views of the pathology of the disease.

Brodie says that some cases of synovitis get well with perfect mobility, others, in which some swelling remains, are prone to relapse.

When suppuration once occurs, Brodie says that adults very rarely, children more frequently, recover, but seldom without complete ankylosis; while if suppuration has not taken place, the joint recovers its mobility. He lays great stress on the curability of the disease before suppuration sets in, and observes that even after considerable destruction of cartilage, the joint may be movable, a statement certainly true, though such a result is rare in the case of the hip.

As regards "scrofulous disease" of the hip, Brodie believes that it may act as a safety valve against similar disease in other parts in some cases, or again may be a focus from which it may take origin.

Erichsen says that ankylosis may occur with or without suppuration; while if pus has formed, ankylosis may be the result, or else a false joint—the upper end of the bone resting on the dorsum ilii. He remarks that if no suppuration occurs, and the head of the bone remains in the acetabulum, bony ankylosis may occur with but little shortening.

As regards the "arthritic" variety, he says it may result in partial or complete ankylosis, but that when suppuration occurs adults very seldom recover, especially if the bone is affected; but that even cases of bone disease, secondary to arthritis, may recover if not tuberculous.

He adds that the prognosis of "primary femoral tuberculosis" without operation is very unfavourable, and disease of the pelvis, if primary, necessarily fatal without excision of the disease; while if the pelvic disease is the result of the femoral, the prognosis is better, and dislocation is the first step towards recovery.

He comes to the conclusion that when once the hip joint is inflamed, more or less lameness will invariably result.

Bryant remarks that inflammation may exist in the joint and subside, and yet suppuration take place around, but unconnected with it. He says that recovery may take place from synovitis, but that ankylosis will probably occur in cases of articular osteitis, and that when suppuration exists, the majority end in fibrous, the minority in bony, ankylosis. He sums up by saying that where there is no abscess there will be a movable articulation, where the cartilage is degenerated there will be ankylosis, while ankylosis without suppuration is commoner after articular osteitis than after primary synovial disease; also, that where the disease begins in the epiphysis, or epiphyseal cartilage, recovery with movement is rare, because the articular cartilage loses its nutritive supply and degenerates, or the epiphysis becomes detached.

Copeland, in Ford's book, records a case of free mobility with sinuses, and half an inch shortening only; but the diagnosis is, I think, questionable,—at any rate it is most unusual.

Holmes tabulates the prognosis as follows:—

1. Before pus forms there may be complete recovery or some limitation of movement by fibrous bands.
2. After abscess appears there *may* be mobility, but it will be impaired.

3. When caries develops, recovery rarely takes place, unless the bony surfaces are dislocated from one another, and hence there will be loss of motion and deformity, with compensating spinal curves.

He believes that where there is bone disease, death is a common (though by no means necessary) result.

Prof. Gross differs from all other authorities in his assertion that "the mortality from coxalgia is slight in almost any event, even if there is palpable neglect"—a statement entirely at variance with general experience, and qualified by himself in another part of his work by the opinion that young adults seldom recover if suppuration occurs.

Macnamara believes that a large percentage of cases of synovitis in children are rapidly cured. Some cases, too, of epiphysitis recover, and the younger the child the less chance of necrosis; but he says acute epiphysitis seldom ends without considerable shortening, and the danger of suppurative osteomyelitis and pyæmia.

Osteomyelitic cases, he remarks, do not improve, but "get worse month by month," and he wisely lays stress on the frequency of tubercular disease elsewhere in these cases, especially if a high temperature is maintained.

Ultimate shortening as result of hip disease depends upon one of four factors: (1) position; (2) dislocation, true or false, *i.e.*, a mere drawing up of the truncated femur; (3) actual destruction of so much bone or its removal by operation; (4) arrest of growth. The first three of these are obvious conditions; the fourth is more uncertain. The arrest of growth, according to some writers, as for instance Croft, is put down to lesion of the growing epiphysial line, as in other bones; but I would point out that very little increase in length in the femur takes place at this line in consequence of the obliquity of the neck, and that growth in length is almost entirely at the other end of the bone. This is further shown to be true by the fact that in a large number of cases after excision the amount of shortening is only that produced by position plus the amount of bone removed. I am of opinion that arrest of growth is due

to general failure of nutrition of the limb, rather than to destruction or synostosis of the upper epiphysial growing line. Croft points out that even when cured in the first stage and no abscess has formed, shortening of from 1 in. to $3\frac{1}{4}$ in. may occur; and it is well to remember this, that even the most favourable cases may have permanent shortening.

The frequency of relapse in cases of hip disease is only too obvious, and is due to the permanent impairment of vitality of the tissue first affected, or to extension from the seat of old disease. It often occurs as the result of fresh injury, or too early and incautious use of the limb, or as a result of failure of health from other causes,—*e.g.*, some intercurrent illness, scarlet fever, measles (most fertile sources of fresh suppuration in old inflammatory foci in children), and so on. This may occur many years after an apparent recovery.

It is important to distinguish between a *relapse* of the joint disease and a *residual abscess*. The latter being merely the result of the irritation of some quiescent *local* product of former inflammation, and having no tendency to spread when once the irritation is relieved; the former being a proof that no consolidation of repair in the original lesion has taken place, hence it tends to progress as in the first instance.

My own conclusions as to the prognosis and result of disease of the hip treated without operation, are in great degree the same as those arrived at by Mr. Macnamara and others (*vide* Gay, *Lancet*, 1872). Cases of acute synovitis recover perfectly, with freely movable joints under proper treatment, and show no after ill effects, though the treatment required is usually longer than that for other joints.

Cases of true hip disease very rarely recover without entire destruction of the upper epiphysis of the femur, usually accompanied by abscess, and always result in shortening, with more or less deformity, and a very large majority die; very few reach adult life, and they are mostly cripples, with ankylosed or stiff and too often use-

less limbs, almost always flexed and often adducted as well. These are the cases that go about from hospital to hospital until, at last, they are excised or die of hectic, lardaceous disease, exhaustion, or tuberculosis. I do not mean to say that it is absolutely impossible for cases of epiphysitis to recover without crippling, but it is only when they are seen in their earliest stage and treatment is thorough and persistent. These satisfactory cases are unfortunately rare exceptions to the rule in hospital practice, though more common among the well-to-do.

Gibney, however, records eighty cases of hip disease cured without operation, and in forty-eight of these there were abscesses (*Med. Rec.*, vol. xiii., p. 174, *Annals of Surgery*, January, 1886). Cazin out of eighty cases had fifty-five per cent of cures in advanced disease (*Bulletin et Memoires de la Soc. de Chir.*, Paris, 1876, *Annals of Surgery*, January, 1886). On the other hand, Jacobsen records 73·2 per cent of deaths out of 63 suppurating cases that were not operated upon (*vide Hueter*).

Cases of acute osteomyelitis very frequently die, in fact, almost all die, unless they are operated on; if they recover, it is with a condition like that described in the chronic cases.

It is only by following up cases that have been recorded as cured by means of non-operative treatment, that it is possible to arrive at the truth that these so often relapse.

Thus, out of nearly 100 cases, of which by enquiry I tried to learn the sequel, at times varying from a few months to three years, I was only able to trace some thirty-five; a few of these were readmitted into hospitals as the result of my enquiries. Of the rest, thirty-one in number, eight were well, five in good condition but not well, nine remained unrelieved or had relapsed, and nine are dead.

I believe the frequency of relapse is very much greater than is represented by the above statement.

CHAPTER VII.

TREATMENT.

THE earliest treatment of joint disease was by counter irritation usually of a violent kind, such as cautery, caustics, issues, setons, blisters, and so on, together with leeches or bleeding, and with this more or less perfect rest to the part, but with little attention to position or the true principles of maintaining rest, hence the most imperfect results at best were obtained. Following this stage of the therapeutics of joint disease came the period of mechanical appliances with the objects of maintaining rigidity of the joint and of placing and keeping it in a useful position; later came extension as a means of lessening pain and irritation. The third and last stage at present is the one which seeks, after investigation of the pathology of the disease, to supplement the insufficient natural processes by removal of diseased parts, and in cases where it is possible for a natural recovery to occur to put the injured tissues in the best possible condition for such recovery. We are hardly even yet in a position to sum up the evidence in favour of these various modes of treatment, still experience is growing and we can come to a provisional conclusion.

It is perhaps hardly worth while to examine at length the older methods of treatment. Caustics and calomel and opium or iodide of potassium together with confinement to bed, and an unwillingness to attempt any operative treatment, even the opening of abscesses, were the main features.

Thus Ford observes, that from the time of Hippocrates downwards, caustic issues long kept open were the principal form of treatment, and he mentions cases of his own which show that such management extending over periods varying from two to five, or "several" years, resulted in cure by

anchylosis, but he remarks that, as a rule, they did as well without treatment, while one case, which was kept in bed on account of the constitutional state, got well. He was strongly against interference with abscesses, and entirely disagreed with Freake, who, on the ground that the disease was the result of an "acrimonious synovia," recommended early opening of abscesses, while Copeland, the editor of Ford's work, condemns the freedom of Van de Haar, who in 1782 opened an abscess of the hip and explored the acetabulum with his finger. Bonnet was well aware of the good effects of putting the limb in proper position, both as a means of relieving pain and diminishing inflammation, while in the more chronic synovial* cases he advocated "percussion baths" with frequent movement. He treated his cases of abscess with much greater freedom, opening them and applying the actual cautery to the abscess sac on antiseptic principles, just as some of the French surgeons do now.

Brodie advocated the use of caustics and extension by weight, and although he was sceptical as to the frequency of absorption of abscess, was not urgent in his advocacy of opening them; while in "scrofulous disease," tonics, rest, Earle's bed, and pressure were his main resources. In regard to more modern treatment it will be convenient to consider the question of excision separately. In the earlier stages of the disease there is a general agreement among surgeons that rest,† immobility, and time are the main factors in a cure, while general hygienic and tonic treatment, good air, especially sea air, and good food are all important, though useless without local treatment. Such means may be supplemented by opium to relieve pain, mercury in small doses, and counter irritation. Such is the substance of the expressed opinion of most writers.

* Fungous disease of the hip.

† It is worth noticing that Mr. Parker, who expresses himself disappointed by the results of rest, records a case where disease in the other hip came on spontaneously during rest. I have more than once seen the same thing (cases 66 and 74).

The exact means of carrying out this advice is a matter of opinion, long splints, simple weights, leather, or starch, or plaster-of-Paris splints, and special apparatus such as those of Sayre, Thomas, and Gillingham, etc., to be hereafter mentioned.

Early opening of abscesses is now generally advocated, although Billroth advises that they should only be opened if an operation is intended to be performed afterwards. Barwell, following Bauer, approves early *tapping* of abscesses. Holmes prefers leaving abscesses alone unless there is pain and increasing swelling. Lister says they *must* be opened.

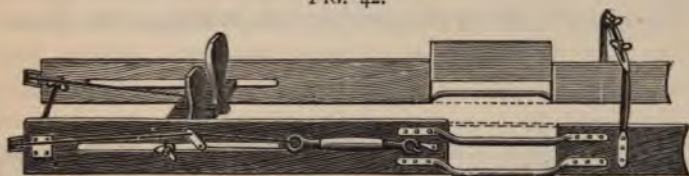
Macnamara advises local application of belladonna in synovitis, and in cases of abscess advises opening but no extension, preferring the shortening and false joint which may result from drawing up of the head of the femur. He prefers, too, an opening at the lower border of the gluteus maximus to the inner side of the middle line, so as not to interfere with a Thomas' splint. He especially insists on the importance of getting tuberculous patients up and about, and condemns rest (that is, in bed). For myself I agree that abscesses should be opened, but as there then remains what is practically a sequestrum as the source of the abscess I think it should be removed—*i.e.*, the upper end of the bone excised (except in cases of residual abscess, *vide infra*).

Extension.—In 1860, Mr. Barwell, by his experiments by means of extension and driving wedges into the space between the head of the femur and the acetabulum, demonstrated that no lengthening could possibly be produced by any such means. His experiments were, however, devised to disprove the occurrence of real lengthening in the early stages of hip disease; they have an additional value in their bearing upon the treatment of hip disease by extension.

Dr. E. H. Bradford, of Cambridge, U.S.A., made further experiments by extension, and found that, though in an adult a weight of one hundred and fifty pounds produced no separation of the head of the femur from the acetabulum,

yet in the fœtus it did do so, a fact explicable by the softness of the cotyloid cartilage and other factors of the joint at that age, and so in disease the softening produced by inflammation of the tissues no doubt does enable extension to have an appreciable separating power.

FIG. 42.



Bryant's splint. I have had sliding pieces made to fill up the interruptions when required; this is seen in the figure.

I have found that too great extension may be a cause of painful spasms, and it is well to bear this in mind that too little or too great extending force are alike inefficient. In cases where treatment without operation is carried out, as for instance where adhesions, the result of old inflammation, exist, or muscular contracture has taken place, the deformity may be remedied in many instances by the ordinary extension apparatus by a weight, or by Bryant's splint. In other cases where simple extension is inefficient, or too tedious, it may be necessary to forcibly straighten the limb under chloroform, and then fix it by splints in its new position. The advisability of forcible straightening is a somewhat disputed point, and is not in all cases free from risk, not only of laceration of important structures, but of setting up fresh inflammation in the joint, or what remains of it.

Mr. Howard Marsh* and, in 1836, Sir Benjamin Brodie advised that the extension should be made in the axis of the limb, as it is at the time, and the direction should be altered as the limb regains its normal position. I do not think this is a matter of great importance.†

* *Brit. Med. Jour.*, July, 1876.

† If it is desired to carry out this plan, probably Hodgen's splint for fracture of the thigh would be the most efficient apparatus.

It is sometimes a matter of difficulty to remedy the mal-position of the limb in cases of fixation in combined flexion and adduction or abduction. Here, where possible, gradual reduction by a Bryant's splint is the best treatment (*Fig. 42*); failing this, and it cannot be always used, a long splint on one side, with a weight to the mal-placed side, should be tried (*Fig. 43*); and, failing this, careful straightening under chloro-

FIG. 43.



Shows extension by a weight applied above the knee, with a long splint on the sound side. Also the simple plan of keeping the child from sitting up by means of the board running behind the shoulders and fastened to the side of the bed. The shoulders are fastened to this board, and the arms are left free below the elbow.

form. These methods are, I think, better than remedying the deformity by weights applied laterally. In more acute cases, where the deformity is mainly due to spasm, gradual extension is best, but by some means the limb must be got as quickly as possible into good position.

Myotomy was at one time extensively practised, but is very rarely necessary. Pancoast, however (*Phil. Med. Times*, May, 1881), advocates tenotomy or myotomy in the second stage of the disease as a means of giving rest. It is chiefly required in the class of cases to be next described.

Where, as the result of nature's cure of the disease, ankylosis has taken place with much deformity, usually flexion, nothing short of osteotomy is of any use, and here

the adductor longus tendon, and perhaps others,* may require division subcutaneously before the limb can be brought straight.

It is, however, exceedingly rare for osteotomy to be required in children at the present time, partly because we do not nearly so often now see limbs in sufficiently bad position to require it, and still more because bony ankylosis is very rare, and gradual or rapid extension will straighten the great majority of limbs. For further details I must refer to Mr. Keetley's papers, read before the British Medical Association, 1884 (vide *Brit. Med. Jour.*, February 9th, 1884), and to his article in the *Annals of Surgery*, 1885.

Osteotomy may be performed in several different ways. Adams' operation is sawing through the neck of the femur on a line parallel with Poupert's ligament, through a small puncture made at the upper part of the great trochanter. This is only applicable to cases where ankylosis has taken place without much destruction of bone, hence chiefly in rheumatic cases. He first performed it in 1869, and it has been done many times since. Gant's operation is infra-trochanteric osteotomy, where the femur is sawn through just below the great trochanter, and is applicable to cases where the upper end of the bone is destroyed. Rhea Barton's† plan was to divide the femur between the trochanters; and Sayre removes a piece, semi-circular in transverse section, by a horizontal section of the bone below and a curved section above.

The object of these two latter operations is to procure a new movable joint. I have seen good results from sections through the neck and below the trochanter with, of course, bony union in the new position. My colleague, Mr. Heath, had a most excellent result after double infra-

* The adductor brevis, pectineus, sartorius, and rectus, and tensor vaginae femoris have all been divided, as well as the adductor longus. I have only once done myotomy for hip deformity.

† Barton in one case excised a portion of bone; in the other merely divided it.

trochanteric osteotomy for rectangular ankylosis (case 13, Appendix ii.). Of Barton's and Sayre's operations I have no experience. They have both, however, had good results.* Mobility has been obtained after simple section, as in Mr. Lund's case (*Brit. Med. Jour.*, 1876). *Vide* also cases by Volkmann, Studensky, and Mordhorst (*Archiv. für Klin. Chirurg.*, B. xxi., H. 3, abstracted in *Medical Chronicle*, vol. ii., 1885, p. 486).

FIG. 44.

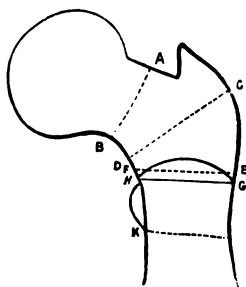


Diagram showing the lines of section in the various osteotomy operations. A B, Adams' line. C D, line of section usually employed in cases of hip disease. E F, Rhea Barton's line (dotted). G H, Sayre's section. K, Gant's infra-trochanteric line. Volkmann's is practically the same as Sayre's. (Between K and H the outline of the small trochanter is shown.)

The operation is not free from risk. In one case where I divided the femur, partly with saw, partly with chisel, carrying my section obliquely through the trochanter, although the disease had been long quiescent, fresh mischief was set up, sinuses reopened, and I had to excise the head of the bone; the section of the bone had quite healed with little trace left behind (case 8).

Wharton, of Pennsylvania, records eight cases of osteotomy, and prefers to make the section at Gant's line with Adams' saw.

In 1877, Mr. Bryant divided both femora with a chisel

* Barton's case was movable for seven years, then ankylosis appeared; of Sayre's first two cases, one was completely successful for five years at least; the second was followed by abscesses and necrosis, and the woman died of tubercular pneumonia. An artificial joint with cartilage, a "synovial membrane," and "complete capsular ligament" was found.

below the trochanters in a case of double ankylosis, and, on the thirty-first day, an old sinus reopened, and the patient died of pyæmia and bed-sores in thirty-seven days.

After osteotomy the limb should be steadied with a splint and moderate extension applied.

In applying extension by weight it should be made an invariable rule to make traction from the condyles of the femur, and not from below the knee. A case is on record in which prolonged extension applied below the knee resulted in separation of the upper epiphysis of the tibia. It is also objectionable in that it throws strain upon the knee joint, and is more apt to slip off. The strapping should always, if possible, be applied for some hours before the weight is attached, in order that the plaster may get set, and not be dragged off by the weight. The strapping (of which Leslie's brown holland is the best) should be kept from the skin by a strip of lint or flannel bandage, or part of a stocking, to protect the sharp edge of the tibia and the prominences of the joint from pressure (*Fig. 43*). A very good plan, used first, I believe, by Mr. Wilson, formerly house-surgeon at the Royal Infirmary, Manchester, is to fix the strapping between layers of plaster-of-Paris, some turns of which should be taken round the foot to prevent cutting of the ankle, or the extension may be made from the sole of a stocking, the leg of which is fixed by bandages. In all these plans the principle is the same.

Aspiration and Incision of the Joint.—Aspiration or incision of the joint with a small knife is a treatment that has been employed now for a considerable time, and is undoubtedly useful as a means of relieving pain and tension where these are prominent symptoms, and in case the disease is synovial alone and acute, may prevent supuration and aid in producing perfect restoration of the joint. In suitable cases it undoubtedly does at once relieve pain, but it is only applicable to the cases I have mentioned; where there is disease of the bone or suppuration, I do not think it does anything more than temporary good. The aspirator needle or a knife—an Adams' osteotomy

knife is a convenient instrument—may be passed into the joint either immediately above or behind the trochanter, and the capsule freely incised so as to ensure opening of the joint. It is not always easy to open the hip joint in this way, and the section must be made boldly in the capsule though the skin wound is limited to a puncture; the opening is then closed and left to heal. I have seen this treatment do great good, and I have seen it entirely fail. I prefer the knife to the aspirator, although the latter has the undoubted advantage of telling us what the nature of the fluid in the joint is.*

Free incision of the joint with subsequent drainage is an operation in favour with some surgeons; it is applicable to cases where suppuration has occurred as a result of synovitis, or as a palliative measure in abscess secondary to osteomyelitis; in the latter by relieving tension it tends to prevent further extension of inflammation in the bone though it is not sufficient to cure the disease, still the opening may be the means of allowing the products of destruction of the bone and cartilage to escape at a later time. Incision may be made at the front of the joint between the sartorius and rectus femoris, the former being drawn inwards and the dissection carried through the iliacus until the capsule is exposed; if preferred, the joint can be reached easily also by drawing outwards the sartorius and so coming down upon the iliacus, or the incision may be made into the back of the joint, dividing the external rotators as in excision. The latter is preferable as affording more free drainage, though a better view of the condition of the cartilage can be obtained from the anterior incision; where it is used a counter opening should be made behind by pushing a director across the joint and cutting down upon it behind the trochanter, a drainage tube may then be passed through the joint. I cannot say I am favourably

* Lister has three times incised suppurating *rheumatic* hip joints with complete success, mobility and absence of shortening resulting.

impressed by this plan of treatment, from what I have seen of it; two of my cases became pyæmic, and in spite of subsequent excision died, and one remained with an open sinus (*vide* cases 6 and 11, also Appendix ii., cases 7, 8, and 9).

Where disease is extensive, except as an exploration, I do not think the operation a good one.

Excision or Resection.—Exception has been taken to the use of the word excision as applied to the operation usually employed in the hip, on the ground that the joint is not excised, but only one articular extremity removed, and although it may be said that in many cases more or less complete removal of the acetabulum is also effected, it is true that objection may be raised to the term, and resection may be preferred; that, too, however, is a term of doubtful meaning. As, however, the word excision is in general use and its meaning understood, it will still be employed here. Excision of the hip is an operation quite of recent development. Although it was suggested first in 1809 by White, of Manchester, Schlichtling and Schmalz were the first to perform the operation in 1816; this, however, appears to have been mere removal of the loose head of the bone, as in the cases of Hoffman, Batchelder, and Klinger. A. White, of the Westminster Hospital, did it in 1818 or 1821, and Hewson in 1828. Brodie is believed to have done it in 1836. Abroad Textor and others operated six times from 1834 to 1845 with one recovery. Sir W. Fergusson revived the operation in 1845, and did five cases up to 1876, all recovered. White's patient died of phthisis five years after.

Indications for Excision.—The indications for excision of the hip form one of the most disputed and difficult questions as regards the disease, the general tendency of recent surgery being to operate much earlier than it was a few years ago.

Mr. Holmes, writing in 1868 (*Diseases of Children*), remarks that cases of hip disease in the children of the poor must, by force of circumstances, be judged on different

grounds to those where prolonged treatment, necessarily extending over several years, can be carried out.* He agrees with Ford that caries is an indication for operation, at least in hospital cases, especially where there is visceral mischief, or progressive failure of health; neither does he think that hectic, amyloid disease, pelvic *necrosis*, or extensive abscess, or even the impossibility of removing the whole disease is any bar to the operation. He considers that resection is applicable almost wholly to children, but that extensive *caries* of the pelvis or phthisis is, except as a palliative, a contra-indication.

Hueter considers resection in coxitis is indicated as soon as extensive suppuration of the joint occurs, or the course of the disease shows that suppuration can be no longer prevented. He points out that isolated recoveries after suppuration are no proof against the desirability of resection. Fock, Eulenberg, and Leisrink hold much the same views.†

Bryant, in his edition of 1876, classes excision as an operation for necrosis, and, therefore, necessary when that is present, and sees no contra-indication in superficial acetabular disease, because, as he says, it is secondary to the femoral, but he condemns gouging of inflamed bone.

Erichsen considers it never necessary in the "arthritic" variety but strongly advocates it in the "femoral."

Annandale operates as soon as there is suppuration.

Barwell regards excision as a means of treatment and not as a last resort, though he apparently does not advocate very early operation.

Gross and Sayre advise early operation.

Macnamara apparently is not an advocate for excision as a common practice, preferring less radical measures for a time, and failing these, amputation in a large proportion of cases.

* Thus Taylor in private practice had only two deaths in ninety-three cases (*Boston Medical and Surgical Journal*, March 6th, 1879; *Annals of Surgery*, January, 1886). Other statistics give a mortality varying from four to thirty-one per cent in hospital practice, but this largely depends upon how long cases are followed up (vide *Annals of Surgery*, January, 1886: Gale).

† Quoted by Hueter from Langenbeck's *Archiv. f. Klin. Chirur.*, Bd. xii.

Howse, I believe, advocates early excision, and always does it when there is grating in the articulation.

Croft advises excision if there is necrosis, and even when the condition of the bone is uncertain; he thinks that abscess indicates operation.

Cowell, in an excellent paper (vide *Brit. Med. Jour.*, vol. ii., 1882), concludes from his 62 cases of excision in patients under 18 years old that the operation should be done when there is grating with either pain or profuse suppuration, or failure of health.

The Clinical Society's Committee concluded that the *pathological* indications for excision are :

1. Necrosis of the femur, or formation of large sequestra.
2. Extensive caries.
3. Intra-pelvic abscess from acetabular disease.
4. Long continued suppuration.
5. Pelvic disease is not a contra-indication.

The *clinical* indications are :

1. Rapid onset of suppuration, with severe local and constitutional symptoms.
2. General albuminoid disease, and long continued suppuration in spite of other treatment.

Mr. Croft's cases and results are instructive; from them he deduces the following rules for treatment:

1. When there is fluid in and about the joint, with starting pains, an antiseptic incision should be made, to be followed by excision if pus associated with panarthrititis be present, or necrosis.
2. The causes of failure are: (1) too late postponement of operation; (2) incomplete removal of the disease; (3) insufficient drainage; (4) not using antiseptics.
3. Early operation is advantageous for:—(1) cases of tuberculosis; (2) the relief of pain; (3) the prevention of atrophy and matting together of the muscles; (4) shortening the duration of the illness; (5) enabling the child to get up and about earlier; (6) procuring a painless movable joint.

It should be noted that some of the best of the French

surgeons, Ollier and others, believe that excision in cases of tubercular disease may directly lead to general tuberculosis by the carriage of bacilli through the vessels opened up by the operation. I think the evidence in favour of this view is doubtful, and further, such cases if left alone are very likely, to say the least, to become generally tuberculous. I do not, however, think that much weight can be attached to the idea of prevention of a general tuberculosis by excision of the focus in the hip, since it is almost certain that some tuberculous material will be left behind in the soft parts. Grosch, Koenig, Esmarch, and Caumont's experience gives little support to such a hope (*Annals of Surgery*, January, 1886).

According to Prof. Vincent, of Lyons, the leading French surgeons are on the whole opposed to excision in the lower extremity while advocating it in the upper limb; and Vincent himself largely employs the actual cautery both to the soft tissues and the bones in tuberculous joint lesions. It appears, however, in any case to be more suitable for the knee or ankle than for the hip (*vide* Ashurst's *International Encyclopædia of Surgery*, vol. vi.).*

Meyer, in 1883, writing after an experience of eighty cases of excision, advocates the operation when caries exists and in doubtful cases advises exploration; he considers the results of the operation are good.

Albrecht, on the other hand, writing in the same year chiefly with a view of ascertaining the etiology and mortality of joint diseases, looks upon excision of the hip as a last resort.

Mr. Gant, in his "Lettsomian Lectures" (*Lancet*, 1871), gives the following rules for excision of the hip:

1. When the health is failing, whatever stage of disease the joint is in, *excise*. Mr. Hancock took the same view.
2. Osseous ankylosis, with malposition, justifies osteotomy, not excision.

* Vide *Le Progrès Medical*, April 11th, 1885, for a Report of the discussion at the French Surgical Congress, and the views of Ollier, Trelat, Verneuil, and Boeckel.

3. Extensive disease of the femur and pelvis is not to exclude excision, for the pelvis often recovers after the friction of the femur against it is removed.

4. The prognosis for excision is bad in cases of "dislocation," which generally goes with advanced constitutional mischief.

The question of when to excise a hip joint is no doubt a difficult one, and it is only after considerable experience of the treatment of disease of the hip by various methods that I feel that I am able to come to some definite conclusion. Before I began work at the Children's Hospital excision was not a very common operation. It had been performed twenty-one times in three years, and a large proportion of cases of the disease were treated at home, or by the usual non-operative methods at the hospital. A very large number, probably about 600, of children suffering from morbus coxæ have come under my care in the last six years, and I have felt it necessary to arrive at some definite rule of practice. During that time I have excised more than 100 hips. The particulars of most of these will be given hereafter, but the conclusion I have come to is this. Treatment, short of excision when once suppuration occurs, is useful only as a palliative, or a means of temporising. My opinion, bearing in mind Mr. Holmes' valuable remarks on the social circumstances of these patients,* is that where there is an abscess outside the joint, or without this great trochanteric thickening, or much pain that does not yield to treatment by rest, excision ought to be performed. While fully aware that abscesses disappear and tuberculous lesions cicatrise under favourable circumstances, I think that in the case of the hip delay is unwise among the hospital class, with whom it is as yet impossible to deal on the same lines as with the well-to-do. In almost every instance I have found much more extensive disease than might be expected from the external

* In private practice, cases are usually seen in the early second stage, and it is possible to ensure that the Thomas' splint shall be kept on and no strain thrown upon the joint, hence recovery without operation is the rule.

evidence, unless the pathology of the affection is borne in mind, and I believe that once this chronic osteomyelitis is established, nothing short of excision can, *in hospital cases*, prevent the ultimate progress of the disease to abscess, and too often to gradual exhaustion of the patient by pain and discharge. Nature, of course, in many cases will, unaided, get rid of the dead bone by slow and tedious processes, but the number of children who can survive the process of elimination is very small, while the mortality after early excision is not great, and the failures are mainly in those instances where the operation has been put off till too late. Where actual necrosis, or caries of the head of the femur, with destruction of bone and cartilage, and often sequestra of varying size in the acetabulum, or at least caries of it are known to exist, I think few advocates of non-operative treatment will be found. It is then, as Mr. Bryant points out, to be looked upon rather as an ordinary operation for necrosed bone than anything more formidable, and that this is the state of the joint even in cases often spoken of as those of early disease, is the fact upon which I should like to lay stress. My proof of it is in my collection of specimens, illustrations of some of which are appended. If we consider the hip joint from the point of view of any other joint, what is the conclusion? A knee joint in which there is suppuration, with caseous masses of bone in the upper end of the tibia or condyles of the femur, is not looked upon as a condition to be treated by rest, good position, and external applications, but one urgently demanding incision, excision, or amputation according to the degree of the disease, and so with other joints. The hip differs from other joints in the severity and extent of the lesion, and in its obscurity from the absence of obvious changes in the early stages; but because it is less easy to see swelling of the hip joint is no reason why its treatment should be different. The hip, as Sayre remarks, requires the "same treatment as other joints, only requires it more urgently."

Again, while incision and drainage are sufficient for

many joints, in the hip the extent of bone disease and the difficulty of obtaining thorough drainage, make such treatment inadequate. Even if it is only to procure free vent for the products of inflammation, we must remove the head of the bone, just as we trephine for circumscribed abscess, or for intra-cranial suppuration.

As soon, then, as there is any evidence of external abscess, excision should certainly be performed, and still better results would, I believe, be obtained by operating even before the pus has escaped from the articulation. The operation is discredited because it is put off until disease is so far advanced that no treatment can have more than a fraction of good results; while timely excision cuts short the disease, saves pain, lessens the time of treatment, and gives a better limb.

Modes of Excision.—Various incisions for removal of the upper end of the femur have been advocated. The original one was, I believe, a T-shaped incision, of which the vertical part extended along the posterior border of the great trochanter and the transverse one across its upper margin. L- and V-shaped incisions have also been recommended, while Gross advises a semilunar flap of the gluteal muscles to be made, the convexity of which is to be downwards. Again, incisions over the posterior border of the trochanter, over the anterior edge, vertically below the anterior superior spine, over the front of the capsule (Parker), and straight down over the middle of the trochanter, as well as others, have been employed. Of these I have only tried four; that over the trochanter in the middle line and slightly concave forward is the one I usually adopt. I have also on one occasion excised by the more anterior incision, and twice by the one over the front of the capsule, also once or twice by incision over the back of the articulation. I see no advantage in any of the others over the one extending downwards for about three inches, more or less according to age and the extent of the disease, along the middle of the trochanter. Where it is proposed to remove a large part of the pelvic wall, a

T-shaped or flap operation may be desirable, but I have rarely had occasion to employ it.

Next the soft parts should be divided vertically above the trochanter and the capsule opened freely, if this has not been done by the first incision. The joint should then be explored with the finger.

As regards the management of the deeper parts and the periosteum, and the question of subperiosteal excision, it is, I think, advisable not to remove any of the soft parts unnecessarily. I prefer to make my first incision well into the cartilage of the trochanter, and then, either with knife or raspator, to separate the muscles attached to it. I have sometimes left portions of cartilage behind attached to the muscles, and sometimes have peeled off the whole trochanteric cartilage and left it *in situ*. Ollier separates the great trochanter with its muscles undisturbed and turns it up, then resects the head and neck, and replaces the trochanter, thus endeavouring to obtain better power in the limb (*Traité des Résections*, 1885). Thomas employed the same plan in his case in 1874.

The next step is to separate the soft tissues from the bone on the inner side, stripping back the periosteum as far as it exists as such. The finger should then be used to pass round the bone and feel that the upper end is free; next, still using the finger as a guard at the inner side of the bone, the femur should be sawn through just below the trochanteric margin with a key-hole or finger saw. Some part of the trochanteric epiphysis is usually left behind. The upper extremity of the bone is then readily prised out with the finger or raspator. The acetabulum should be then examined and any sequestra removed.* If there is a large carious surface it may be gouged or scraped with a Volkmann's spoon or left alone. I think it is well to remove any rough or semi-necrosed bone, but I doubt the possibility of being able to remove all the disease

* Hancock and Erichsen removed large portions of pelvis, but these apparently were actual sequestra.

without greatly adding to the severity of the operation where there is extensive inflammation without necrosis, nor do I think such treatment desirable.

FIG. 45.

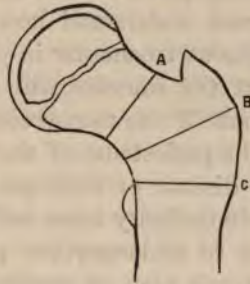


Diagram altered from Barwell, showing the lines of section used for excision of the hip. A, supra-trochanteric section. B, the usual section through the great trochanter. C, infra-trochanteric section used for cases of extensive disease. In Thomas' plan the trochanter is separated and left behind.

The upper end of the femur should be examined to see if the whole disease has been removed, if not, a further section should be made, and this may be carried a considerable distance down the shaft; six inches have been removed with a good result and but little shortening, by an American surgeon.

Here it is well to point out the danger of the practice of thrusting the head of the femur forcibly out of the wound before sawing it through, instead of dividing it *in situ*. Several cases of fracture of the shaft of the atrophied fatty bone have occurred. I had one case myself among my earlier operations, and I have also separated the lower epiphysis in an infant in manipulating the femur during incision of the joint. An additional objection to this practice is the ease with which the periosteum may be thus stripped off the inner aspect of the shaft and so necrosis may occur.

The operation is much more easily and safely done in the way I describe, and involves less violence to and less division of the soft parts. The finger is quite as good a guide as the eye to the condition of the bone.

The subperiosteal method about which so much has been written is one that should be followed, in so far that the bone should be well cleared before it is removed and no unnecessary muscle, etc., taken away. As to making a formal dissection of the periosteum from the whole of the part removed, I cannot understand how it can be peeled off from the cartilaginous trochanter in young people, and there is no fear that the muscles will not re-acquire an attachment to the bone if the transverse incisions are not made too freely. The periosteum of the neck of the bone is separated by the disease or destroyed, and the section should not be made in ordinary cases sufficiently far below the great trochanter to endanger the periosteum of the shaft. Professor Sayre's plan of stuffing the periosteum with tenax I have not tried, nor can I quite understand how he finds a distinct periosteal sac into which to put it.

Usually no vessels require ligatures though there is sometimes free oozing of blood. A suture may or may not be put through the edges of the wound to partly close it, but this is not a matter of great importance; if the case is one with old standing sinuses I prefer to leave it quite open, and in any case a large drainage tube should be passed deep into the cavity of the joint. Any sinuses or abscess cavities should then be scraped out and well drained before applying the dressing. It will often be found that a distinct membranous layer of lymph lines the cavity of the articulation, but there is rarely anything like the thickness of granulation tissue so often seen in the knee and other joints.

There is not, I think, any advantage in removing only the head of the bone and leaving the trochanter.* In many cases the head of the femur is so far destroyed that it would be impossible to do less than take away the trochanter, while, as Mr. Henry Smith following Sir W. Fergusson has pointed out, the trochanter if left tends to block up the

* A reference to the locality of disease on page 30 shows how often a section through the neck will leave unhealthy bone behind. I have tried both plans.

orifice of the wound and prevents the free escape of discharge and débris of bone, and thus interferes with one of the main objects of the operation. The Clinical Society's Committee, however, advised that the trochanter should be left unless diseased, or unless there is extensive pelvic disease.

Where intrapelvic abscess exists Hancock advised trephining the acetabulum, and his advice is no doubt good. Examination per rectum would enable the diagnosis to be made if this condition was suspected. Sayre recommends chiselling away all diseased acetabulum down to the level of the detached periosteum on the internal surface, but in most cases it appears to be unnecessary to do this.

Many operators recommend piecemeal removal of the bone in cases of excision in order to save muscular attachments as much as possible; among these the late Mr. Gay advocated breaking up the diseased bone with a steel probe and then extracting the fragments. I do not like the plan, for it probably implies imperfect drainage, and fragments are apt to be left behind to necrose.

As regards the use of antiseptics, they should, of course, be used in cases where there is no external wound. Of the use of chloride of zinc I am much more doubtful; it is recommended by some surgeons to use a solution of forty grains to the ounce. I can only say that, having seen its effects upon the tissues of other parts in children, I should not like to employ it. I have seen extensive sloughing follow its use; also in two cases in which I used a twenty-grain solution to wash out the sinuses and cavity, it was followed by much greater bleeding and subsequent alarming shock than in most other operations, and I cannot think its use free from danger. Although in one of these instances it did undoubtedly prevent putrefaction, I do not advise its use. The most convenient form of dressing afterwards I have found to be a thick pad of wood-wool over a thin layer of wet gauze; the wood-wool pad may be made triangular or pyriform so as to fit round the thigh. Iodoform should

be freely dusted into the wound before applying the dressings. With wood-wool very few dressings are required.

Following Mr. Howse, I prefer to have the extension put on before the operation, so that the weights, or, better, Bryant's splint, can be applied at once before the patient is put to bed, and I cannot agree with Professor Gross' view that extension is painful or mischievous. The shock of the operation is often somewhat severe, but usually soon passes off under the use of opium and stimulants. Sometimes, however, much more severe and prolonged shock occurs, and this may even prove fatal, as in case 98.

The subsequent management of the case requires some special remarks. I have found it exceedingly difficult always to keep the wound aseptic, and must confess to many failures in this respect; still, as in my experience comparatively few cases can be treated in hospital till the wounds completely close, they are under somewhat different conditions to other patients. It is, however, a great gain if the wounds can be kept sweet even for a time.

I am at a loss to know what Professor Gross' remarks mean, viz.: that "one of the difficulties experienced after the operation is to keep the end of the femur in contact with the acetabulum."

Any attempt to do so would surely add to the pain of the patient and tend to increase the disease in the acetabulum, as well as add to the necessary amount of shortening and make ankylosis more probable.

The after treatment of cases of excision simply consists in dressing and in keeping the limb quiet and in good position. This may be done by various means, of which the best ones, I think, are simple extension by a weight (the weight may usually be reckoned at one pound for each year of the child's age from two to six; six pounds is generally enough up to twelve years of age, after which more may be added) with or without a long splint on the opposite side, and a Bryant's double splint, which has many advantages in securing "parallelism of the two limbs," and in the ease and comfort with which the patient

can be moved. Bryant's splint is invaluable, and I now almost invariably use it (*Fig. 42*).

Mr. Barwell lays much stress upon the necessity of not letting the operation wound close too soon, and of the risk of insufficient drainage setting up osteomyelitis, and he is, of course, right. Where any bagging of pus occurs counter openings should be freely made. I have found it a good plan in some bad cases to keep the patient tilted over so as to lie almost upon the diseased side, and in other cases, where there has been much discharge, and a difficulty in keeping it sweet, I have kept the joint cavity constantly irrigated through openings at the back and front, with good results.

I am sure that in many cases the use of elastic pressure, by means of a Martin's bandage, has been of great service, especially where any indolent thickening of the soft parts remains, or there is a tendency for the sinuses to be flabby and sluggish.

It is unnecessary to describe all the various apparatus which have been devised for hip disease, such as Gillingham's, Hutchinson's, Taylor's, Bauer's, Hamilton's, Washburn's, Davis', Andrew's, Barwell's, etc.; many of these are figured in Mr. Thomas' book. They are all designed to meet one or both of two great objects, immobility and extension.

Bonnet's "*grand appareil*" is said to be fairly efficient as far as immobility goes, but it is clumsy and expensive and is now never used. Sayre's splint, which aims at combining mobility with extension, a doubtful advantage at least, is very expensive; it is much better suited for use after excision.

Bryant's, Campbell de Morgan's, and Cripps' splints are only applicable, of course, to cases while in bed. Of Bryant's I can speak most highly. I consider it the most valuable splint we have for this disease as long as recumbency is necessary; it prevents flexion, ensures "parallelism," and enables the patient to be turned over or lifted easily and painlessly without disturbing the joint.

Thomas' apparatus is a very valuable appliance and is undoubtedly the best splint we have for patients able to be up (*Figs. 46 and 47*). Though I by no means agree with

FIG. 46.



Thomas' hip splint, adjusted for a case with no deformity.

many of Mr. Thomas' rules of treatment, I most heartily acknowledge our indebtedness to him for his various appliances, and do not propose to discuss other questions here.

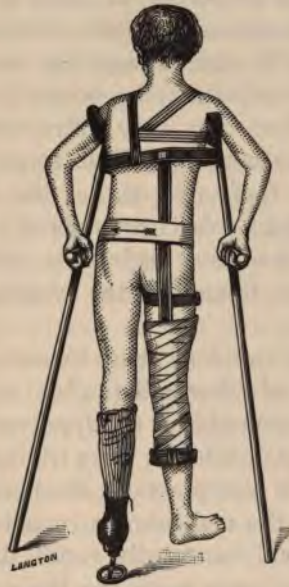
The splint is of use, first, in the early stages of disease, where it is possible to give the child the chance of long continued and perfect rest with general hygienic measures; and, secondly, after excision, to keep the limb quiet for a time until the parts are sufficiently consolidated to allow of movement being begun. I have habitually used it for several years.

There is always, as the parts cicatrise, a tendency to flexion and adduction of the affected limb after excision, and this must be avoided or a comparatively useless leg will result. As soon as the limb gets firm, it is a good plan to get the patient up and let him support himself and walk a little with crutches and a patten on the sound limb, so that the other leg may hang freely and the weight

of the limb will then straighten it and ankylosis will also be prevented ; or in such cases a Thomas' splint may be employed to put and keep the limb straight.*

The sooner excision cases are got up and about the better ; some cases may leave their beds in three weeks, others, of course, are much longer in getting up, the difference depending mainly upon the state of the disease at the time of operation.

FIG. 47.



Thomas' hip splint, applied. Slightly altered from Mr. Thomas' work on the *Hip, Knee, and Ankle*.

I should estimate the period of convalescence after excision as varying from the time mentioned to two years, while in some cases sinuses may remain open much longer if pelvic disease exists. I keep my patients usually in a Thomas' splint for from at least three to six months after

* For details of its manufacture and mode of application, I must refer to Mr. Thomas' book on *Diseases of the Hip, Knee, and Ankle*.

excision; after this the child, if old enough, should get about with a patten and crutches allowing the limb to swing, and only after a year or more should he be allowed to gradually bear weight upon the leg. If, however, excision is done early the limb is fit for walking sooner, sometimes in five or six months. If the affected leg is allowed to touch the ground too soon, it becomes pushed up upon the dorsum ilii, and much shortening results. On the other hand, if the limb is fixed too long, it becomes stiff. A very large proportion of cases of excision in the later stages of the disease remain with sinuses, but often these produce no ill result except the trouble of dressing them; a certain number may be got to close by scraping, cautery, etc.; others are very intractable. A certain number of cases—according to Yale 20 per cent, according to Neuber about half—relapse, *i.e.*, the wound re-opens after having healed; this is undoubtedly common, but is usually due to over use, neglect or violence, and with ordinary care and treatment the wounds usually again close.

It is interesting and important to note that in measuring the amount of shortening after excision the real shortening—as measured from the upper end of the femur to the malleolus on each side—is often trifling and sometimes there is none, while the practical shortening as measured from the pelvis to the malleolus is considerable. Though some shortening will necessarily result, this arises mainly from weight being borne upon the limb prematurely. It has already been pointed out that growth in length of the femur takes place almost entirely at its lower epiphyseal line, hence the loss of length or true shortening is only the distance from the line of section to the top of the head coupled with such arrest of growth as may result from impaired nutrition, this last being, of course, a very inconstant quantity. Ollier estimates that during the first four years of life growth takes place about equally at each end of the femur; after that time the lower end grows more rapidly until at last its rate of increase is about

three times that of the upper end (*Rev. de Chir.*, 1881; *Annals of Surgery*, Jan., 1886). Wolff considers the shortening of the femur after excision is only to the extent of the part removed (*Berl. Klin. Woch.*, 28-30, 1883; *vide* Canstatt's *Jahr.*, 1883).

Several attempted substitutes for excision of the hip have been proposed. One was to saw through the neck of the bone and leave the head *in situ*; by this means it was thought absolute rest might be given to the articulation. I have known of one case in which this operation was put in practice, when, owing to an accident, excision had subsequently to be performed, and, so far as I know, the plan has met with no favour, and I think rightly so for obvious reasons.

Macnamara and Greig Smith advise tunnelling through the trochanter with a drill or gouge, and so not only relieving tension in the joint but setting up more active change in the bone, by which they hope to get rid of the tubercular products in the cancellous tissue. The idea is a good one, and I have tried it in a few instances, with a good result in some cases at least (*vide* cases 10, 11, 12, Appendix ii.), but I fear it is not radical enough and only applicable to very early stages.*

Dr. Fitzpatrick in 1867 advised in certain instances, chiefly in the early stages or where the joint was converted into a "foul suppurating cavity," that the trochanter should be perforated with a knife or trephine, and the cavity treated with a stick of potassa cum calce. Injection of various antiseptic agents, iodoform and ether, carbolic acid, iodine, etc., into the diseased tissue has been advised as a mode of arresting the disease, but from their inertness in the more accessible synovial disease of the knee in my hands I have no faith in them.

*In one case Mr. Macnamara found that there had been a fresh formation of articular cartilage after drilling, the old cartilage having been thrown off. V. P. Gibney.

Statistics of cases of excision of the hip from various sources :—

Table of 2,461 Cases of Excision of the Hip.

Year.	No. of Cases.	Recovery.	Death.	Remarks.	Authority.
1860	109	71	36	... ..	Sayre.
1861	49	20	15	11 doing well	C. K. Winne.
"	104	56	32	36 useful limbs	Barwell.
"	111	56	53	... ..	Hodges } Gant.
1861-68	112	52	60	42 could use the limb, 14 without support	Good }
...	78	38	26	.....	Fock, Holmes, and Barwell.
1870	170	72	98	52 died within a month of pyæmia and exhaustion	Leisrink.
1871	82	57	22	.....	Gant.
1877	12	7	2	.....	Erichsen.
1881	16	15	1	.....	Hulke.
"	24	22	2	.....	Morrant Baker.
"	18	16	2	.....	Macnamara.
"	215	175	40	Collected from 6 hospitals	Holmes.
"	45	36	9	.....	Croft.
"	203	175	28	.....	Clinical Society Committee.
...	250	103	147	.....	Jacobsen (Hueter).
...	418	244	174	.....	Culbertson.
...	62	58	4	.....	Cowell.
...	48	44	4	.....	Volkman.
...	33	17	16	.....	Korff.
...	166	122	44	.....	Grosch.
...	36	25	11	.....	Alexander.
1880-86	100	85	15	5 of these more than a year after operation (<i>vide</i> Table)	Wright.
	2461	1566	841		

The table gives the actual results of excision in a larger number of cases than has yet, I believe, been put together, and might, of course, be largely added to if all the small groups of cases were collected, though perhaps some cases are reckoned twice.

It will be seen that the gross average mortality among the 2,461 cases was about 34 per cent, but this proves little, as is readily seen by the differences in different surgeons'

results, which probably largely depend upon the stage of disease at which the operation is done as well as other circumstances, such as modes of dressing, time of taking final results, and especially the age of the patients.

The causes of death after excision are either those common to all wounds, viz., the various septic diseases, shock, hæmorrhage, etc., or extension of the local mischief or tuberculosis, hectic, lardaceous disease, and so on.

Of 105 deaths, Leisrink found twenty-four died of "accidental wound diseases," twenty-three from exhaustion, twelve from phthisis, three from diarrhœa, eight from amyloid disease, four from progressive caries.

Mortality increases with age, except in the very young (under two years).

Section of the femur below the trochanter, according to Gant's figures, gives 13 per cent. better results than section above it.

Disease of the acetabulum considerably increases the rate of mortality. In seventy-two cases 39 or 54·16 per cent died. A very high rate, when we consider that in Gant's 42 cases of amputation at the hip a mortality of only 42·8 per cent followed.

As to permanence of result Good's fifty-two cases of cure included in Gant's table were seen, on an average, nineteen months and four days after.

Hodges gives 230 days as the average period of recovery in his forty-nine cases.

Alexander, of Liverpool, compares fifteen cases of hip disease treated by excision with fifteen cases treated without operation. His results may be summarised thus:

The average age of those excised was fifteen years, of the non-operated twelve years. The general condition of the cases on admission was fairly similar in the two sets. After excision twelve were living, eight had useful limbs, three were amputated, and one had a useless limb. After treatment without excision four were cured, eight died, one was believed to be dead, two unknown.

*Table of 30 Cases of Hip Disease by Dr. Alexander, of Liverpool,
15 treated without operation, 15 by Excision.*

TABLE I.—EXCISION.

No.	Sex.	Age.	Duration of Disease.	Right or Left.	Cause.	Duration of Treatment and its Nature before Operation.	Result.	Condition of Limb.
1	M.	13	1 yr.	R.	Un- known	8 mos.; splint (Thomas')	Cure in 1 mo.	Arc of motion 40°.
2	F.	9	2 yrs.	L.	"	Rest 2 yrs.	Death, 12 hrs.	.....
3	M.	14	6 yrs.	R.	"	Rest and weight 9 mos.	Convalescent; seen 3 mos. after	Useful limb; one sinus; no mobility.
4	M.	6	2 yrs.	L.	"	Uncertain	Death in 7 weeks from albuminuria	.....
5	F.	12	1 yr.	L.	"	Rest 10 mos.	Convalescent, 4 mos.	Anchylased limb.
6	F.	15	14½ yrs.	R.	"	In hospital often	Died in 6 wks.; hectic, etc.	.....
7	F.	30	10 yrs.	R.	Fall	Rest	Recovered, 3 mos.	Excellent limb; arc of motion 50°.
8	F.	8	2 yrs.	R.	"	6 mos. rest	Recovered, 6 mos.	Useful limb; anchylased; sinuses.
9	M.	34	9 mos.	L.	Intra-capsular fracture	Rest 12 mos.	Recovered, 4 mos., after pyæmia	Arc of motion 45°.
10	M.	7	2 yrs.	L.	Fall	Rest	Old excision; amputation; well	.....
11	M.	24	Several years	R.	Un- known	Rest	Failed; amputation; died in 1 yr. from lardaceous disease	.....
12	M.	8	A few weeks	L.	Injury	Rest 8 mos.; weight	Amputation after 6 mos.; well	.....
13	F.	8	3 yrs.	R.	Fall	Rest for a time	Sinuses; anchylosis	Useless limb; flexed.
14	F.	14	2 yrs.	L.	"	Rest for some time	Anchylosis; walks fairly; general condition good	.....
15	F.	19	2 yrs.	R.	"	Thomas' splint; rest; aspiration; 2 yrs.	Good; 1 sinus	Arc of motion 45°.

*Table of 30 Cases of Hip Disease by Dr. Alexander, of Liverpool,
15 treated without operation, 15 by Excision.*

TABLE II.—NOT EXCISED.

No.	Sex.	Age.	Duration of Disease.	Right or Left.	Cause.	Duration and Nature of Treatment.	Result.	Condition of Limb.
1	M.	13	2 mos.	L.	Fall	6 mos. rest ; splints	Died ; operation refused	.....
2	M.	9	9 mos.	L.	Un- known	4 mos. rest	Died of amyloid disease ; operation refused	.....
3	F.	10	Uncer- tain	L.	Un- known	4 mos. rest	Died ; phthisis and lardaceous disease	... ..
4	F.	9	Uncer- tain	L.	Fall	Rest ; Thomas' splint ; 1½ yrs.	Died ; larda- ceous disease ; operation refused	.....
5	F.	8	Uncer- tain	R.	Un- known	Extension ; Thomas' splint ; 18 mos.	Anchylolosis	.....
6	F.	7½	2½ yrs.	R.	Fall	Rest ; exten- sion ; 2½ yrs.	Died ; larda- ceous disease	.....
7	M.	6	1 yr.	R.	Fall	Rest ; exten- sion ; 4 mos.	Unrelieved ; operation refused	.....
8	M.	13	2 yrs.	L.	Fall	4½ mos. ; Thomas' splint	Cured ; no sinuses ; early disease	.....
9	M.	32	5 yrs.	R.	Cold	Rest 8 mos.	Lardaceous ; operation refused ; unrelieved	.....
10	M.	3	1 yr.	R.	Measles	Extension ; Thomas' splint ; 18 mos.	Cured	Partial anchylolosis.
11	F.	30	2 yrs.	L.	Blow	Thomas' splint ; 6 mos.	Relieved	.....
12	M.	13	5 yrs.	R.	Fall	Rest 1 mo.	Well	.....
13	M.	15	14 mos.	L.	Fall	Rest	Died ; refused operation	.....
14	M.	7	11 mos.	R.	Un- known	Rest 1 mo.	Died ; too late for operation	.....
15	F.	5	Uncer- tain	L.	Un- known	Rest ; extension	Death ; amyloid disease	.....

SUMMARY.—*After Excision:* Average age 15 years, 12 living ; 8 useful limbs ; 3 amputated ; 1 useless limb. *After Treatment:* Average age 12 years, 4 cured ; 8 dead ; 1 believed to be dead ; 2 unknown. General condition of cases fairly similar on admission in both tables.

Dr. Alexander concludes that "lethal, local, and locomotor results are twice as favourable where operations are performed," and that the time occupied in treatment is very much less.

The Clinical Society's statistics are well known :

1. Forty-five cases of excision, 35·5 per cent died from causes connected with the disease, 13·4 per cent dying of tuberculosis.

2. The average duration of treatment was one and three-quarter years, the average shortening $2\frac{3}{4}$ inches, and movement was free, limited, or nil in the proportion of 11 : 6 : 3.

3. Of 203 cases of excision 13·7 per cent died directly from the operation.

4. Of the cases treated without excision 260 were suppurating, of these 30·4 per cent died of causes connected with the disease, 9·2 of tuberculosis.

5. The duration of treatment was two and a half years, the average shortening in thirty-three cases was 1·6 inches, and movement was free, limited, or nil in the proportion of 5 : $4\frac{1}{2}$: 3.*

Jacobsen, in sixty-three suppurating cases seen in Copenhagen and not operated upon, found a mortality of 73·2 per cent.

In my own experience useless flail joints are exceedingly rare, and limited to those cases where the excision was performed in very late stages of the disease; the powerless condition is, I take it, the result of the disease, not of the operation (*vide* case 99). Where there is little mobility either after operation or spontaneous cure compensatory mobility in the spine makes up largely for the stiffness of the hip.

Of the 100 cases excised, particulars are given in the table, p. 136, and the Appendix.

* It must be remembered that these figures are mainly based upon the results at the Alexandra Hip Hospital, where children are kept for any length of time required. Such arrangements are obviously impossible for ordinary hospitals.

Statistics of Committee of Clinical Society on Excision of the Hip in Children, 1881.

I.—EXCISION.

- Mr. Croft.*—45 cases. { 35·5 per cent died from causes connected with the disease, of which
1. { 13·4 per cent died from tubercular disease, and
7 cases died from results of operation.
2. Average duration of treatment was 1 $\frac{3}{4}$ years.
3. Average shortening was 2 $\frac{3}{4}$ inches.
4. Movement free, limited, or nil in the proportion of 11 : 6 : 3.

Mr. Bryant and Mr. Baker's cases, etc. 203 cases. 13·7 per cent died directly from the operation.

II.—CASES TREATED WITHOUT EXCISION.

- (a) *Cases with Suppuration, 260.* { 30·4 per cent died from causes connected with the disease, of which
1. { 9·2 per cent died from tubercular disease.
2. Average duration of treatment 2 $\frac{1}{2}$ years.
3. Average shortening in 33 cases was 1·6 inch.
4. Movement free, limited, or nil in the proportion of 5 : 4 $\frac{1}{2}$: 3.
- (b) *Cases without Suppuration, 124.* { Total mortality 10·5 per cent.
1. { From tuberculosis 7 per cent.
2. Average duration of treatment in cases that recovered, rather less than 3 years.
3. Average shortening in 17 cases 1·4 inch.
4. Movement free, limited, or nil in proportion of 5 : 3 : 3.

Croft's Table of Cases of Excision of the Hip.

No. of cases.	Cases under treatment.	Cured.	Dead.	Cause of Death.	State at time of operation.	Duration of previous treatment.
45	12	17	6 As result of operation	Pyæmia ... 3 Septicæmia. 1 Exhaustion and thrombosis ... 1 Diphtheria. 1 After amputation 10 mos. later 1	<i>Cured.</i> All had abscess. Acetabulum perforated in 3 cases. Sinus in 6. 12 "began as synovitis." 6 as otitis	From 2 days to 3 months, 13 cases. From 3 to 6 months, 4 cases.
			9 Died of causes independent of operation, from 2 $\frac{1}{2}$ mos. to 4 years later	Tuberculosis 2 Lardaceous disease and tubercle ... 7	<i>Died.</i> 11 had chronic sinuses, 5 had perforation of the acetabulum	For 11 months, 1 case.

In all the trochanteric epiphysis was preserved, and the operation was subperiosteal.

Fourteen of the cured cases had movable joints.

In 1879, Mr. Croft excised both hips in a child of four, applying chloride of zinc to the synovial membrane afterwards. The case recovered in five weeks.

The primary objects of the operation of excision of the hip are to save life and relieve pain; the next most important question is that of the usefulness of the limb and of the condition of the "joint" after the operation. One of two results must occur after excision, either a freely movable limb or one with varying degrees of stiffness from some mobility to bony ankylosis. Bony ankylosis after excision is very rare.* Close fibrous union so that but little mobility remains is very common; movement through from 30°-50° is perhaps the commonest result, and a smaller number have complete mobility. The first necessity for a useful limb is that it should be able to bear the weight of the trunk and a stiff leg is better than a too mobile one. Gant says the upper end of the femur lodges just above the acetabulum and he has generally got a "firmly fibrous movable joint," and he has removed 4 inches and 4½ inches of bone from the femur, leaving a useful limb afterwards, while Dr. James Morton has published an American case where 6 inches of bone were removed without subsequent shortening. Holmes considers the results of operation are inferior to those of the natural cure and prefers drainage in many cases though not early opening of abscesses (*Lancet*, 1879).

Sayre states that of his fifty-nine cases thirty-nine recovered; of these twenty had motion and less than 1 inch shortening, eight had mobility and more than 1 inch shortening, two had ankylosis. Volkmann says, as quoted by Holmes, that half the cases that recover can walk without the assistance of a stick, and nearly half with

* Some surgeons advocate the attempt to procure bony ankylosis when the limb is likely to have to bear heavy work (vide *Med. Rec.* x. p. 6, 1882).

one stick. Holmes thinks nearly, if not quite all, walk painlessly and nimbly.*

The committee on hip disease (Clinical Society) reported that the limb is generally less useful after excision than after other modes of careful treatment. I have found that the limb after excision, though necessarily less stable than an ankylosed limb, is generally more useful than the natural cure.

Sayre, in his case of osteotomy for ankylosis, describes the reformation of cartilage on the cut surface of the bone,† and Ollier, at the Medical Congress in 1881, spoke of regeneration of cartilage taking place after subperiosteal excision of joints (vide also Ollier, *Traité des Résections*, 1885). Where this occurs it no doubt adds considerably to the mobility of the limb and to its smoothness and durability.

Küster, Israel, and others have recorded cases of more or less perfect remodelling after excision of the hip (vide Canstatt's *Jahr.*, 1883).

In my own cases I have not, as a rule, allowed attempts

* In 1877 Holmes recorded the after results of three cases of excision.

1. Jas. T., æt. 23. Eleven years after operation the whole limb was wasted; there was 3in. shortening, 2in. belonging to the femur, and 1in. to the leg; the pelvis reduced the apparent shortening to 2in. The whole trunk was less on the diseased side. Movements were free and painless, with slight clicking. Unable to stand on that leg alone; is weakly, pale, and sedentary in habits, but can walk ordinary distances and do work easily.

2. Louisa S., æt. 18. Twelve years after excision. Limb somewhat wasted; 3½in. shortening, all in the thigh. There is good union; can flex and abduct; there is free, painless, passive motion. She can just stand alone on the leg. Her health is good. Her occupation sedentary.

3. Lydia B., æt. 15. First operation at two years old. Some bone removed some years after. Real shortening less than 2in. Is very fat. Limb well developed. In flexion the pelvis moves somewhat with thigh. Other movements free and painless. Can stand on limb for five minutes. Walks four miles daily.

French, in 1848, excised the hip in a child ten years old. At twenty-two years old there was 3½in. shortening. The bone had been removed below the small trochanter. There was some power of flexion. The limb was atrophied and not of much use; there was an ulcer on the foot.

Wolff examined a case of excision ten years after operation which was done at two years old; the boy could jump, play, and do gymnastics; the total shortening was 2½ cm. *Verhandl. d. deutsch. Gesellsch. für Chir.* xi., Congress S. 121.

† Cf. also Sayre's case of nearly complete reformation of the upper end of the femur after excision, in *Trans. Med. Cong.*, 1881.

at walking for a long time after operation, and indeed for long after walking was possible with the object of minimising the shortening due to pushing up of the femur on to the dorsum.

Hueter, however, believes that in all cases, ultimately, the small trochanter comes to rest in the acetabulum.

Leisrink, from an examination of sixty-one cases of excision, found in two only was there ankylosis; in the others more or less mobility; and the shortening varied to as much as 8 cm. (*vide* also Ollier, p. 108 *supra*).

An examination of my cases of excision of the hip shows that the necessary mortality of the operation is very small; death occurs from extension of the disease, or from tuberculosis, or the affections incident to all operations; excision of the hip in itself is not more dangerous than a necrosis operation elsewhere. Of the 100 cases in the accompanying table (p. 136) only three at most of the total number of deaths died of the direct results of excision, that is of the operation, though two died shortly after excision from pyæmia, resulting from previous incision of the joint (*vide* Table). Hence the operation must not be rejected in childhood on account of its dangers. Next the relief from pain is most marked except during dressing; cases of excision are, as a rule, quite free from pain after the first day. Very rarely is there anything approaching the previous pain of the disease. In cases of progressive mischief after operation there is, of course, pain, as fresh abscesses form, but this is rather an argument against too late excision than against the operation at all. Mere opening of abscesses and still less expectant treatment can hardly be considered a satisfactory mode of getting rid of sequestra, yet in no less than thirty-nine of the cases in the table were there actual loose sequestra, while in many others there were patches of bone which was practically dead though not loose, *vide* figures. The possibility of removing sequestra without a formal excision is worth trying in some cases, but it is often impossible to discover the presence of the sequestra until the end of the

bone has been removed, or to extract them if found. Moreover, even after removal of sequestra, others may exist and not be found, and in other instances the disease progresses in the surrounding bone and necessitates subsequent excision (as in case 93). There are often, too, other foci of disease in the medulla, which are as great bars to recovery as the sequestra themselves.

FIG. 48.



Shows the result after excision of the left hip. The photograph from which the figure was drawn was taken before she was allowed to walk, and there is therefore no perceptible shortening except what is corrected by the slight pelvic tilting. Mary M. B., case 12.

FIG. 49.



Side view of figure 48.

I have not found it possible to estimate in figures the results to be expected from excision. Too many factors enter into the calculation to make such an estimate trustworthy, but roughly, I should expect, among 100 cases excised at the time I recommend, to lose or have to amputate about 15, to have about 10 unsatisfactory or useless limbs, and about 75 useful limbs with or without sinuses, and with shortening, varying from 1 to 3 inches.

Such results to be estimated one year after operation. *Figs. 48 and 49* show a very good, and *Figs. 50 and 51* a good result after excision.

FIG. 50.



From a photograph showing a good average result after excision, when the leg has been walked upon, and the stump of the femur is thrust up upon the dorsum ilii. James B., case 46.

FIG. 51.



View of figure 50, showing back view and mobility.

Whether then we consider the pathology of the disease, the actual local condition, the relief of pain, the preservation of life, the duration of illness, the condition of the limb and its usefulness, or the dangers of secondary disease, on every ground, in my opinion, excision is the best course under the circumstances already stated.

Double hip joint disease has already been alluded to as giving rise to the peculiar "scissor-legged" deformity in some cases. It is not a very rare condition. I have met with about half a dozen cases altogether. In two of these, as already mentioned, disease of the second hip came on while the child was lying in bed for the original mischief.

In both of these I excised both hips, with an excellent result in one case and relief in the other.* The condition after excision of both hips is much that of double congenital dislocation (*vide* case 74). There are no special features of the condition other than those alluded to, and the treatment is that of the single affection, except that a double Thomas' splint is required, and progression is impossible until the disease is absolutely well, unless by the use of double Thomas' knee splints as soon as the hips are quiescent. For a figure of one of the deformities liable to occur, *vide* *Fig.* 41, and also case 13, Appendix ii.

To summarise then the treatment of hip disease. First, the ideal treatment consists in seeing the case early, keeping the child in bed until by simple extension or a Bryant's splint the limb is straightened; then a Thomas' splint should be applied,† and the child allowed to get up and about, out of doors, by the seaside. Good food, cod liver oil and iron, with occasional administrations of rhubarb and soda if any dyspeptic troubles appear, comprise the rest of the management. Two years should be the time given for rigid treatment; after this the splint may be gradually laid aside, and the child allowed to go about with a patten and crutches for a few weeks; if still there is no sign of disease, walking upon the affected limb may be gradually permitted.

In hospital practice the nearest approach to the above lines of treatment should of course be carried out, but if there is progressive disease and the management is unsatisfactory, excision should be performed at the first sign of external abscess, or before if the symptoms are acute. In either case the presence of progressive disease in spite of treatment, with an abscess other than a residual one, or sinuses, or great thickening, indicates immediate excision. If sinuses exist with receding disease, diminishing discharge,

* This second case, however, is now (Oct., 1886) slowly sinking with albuminuria.

† Or the limb may be straightened by means of the Thomas' splint.

and puckering in of cicatrices, or if with an abscess the mischief is quite quiescent or receding, non-operative treatment should be adopted for a time, if it can be thoroughly carried out ; if not, or if no progress is made in a few weeks, the diseased part should be removed.

AMPUTATION.

The question of amputation at the hip joint for disease is one of the highest importance. We must consider not only the unavoidable mortality and crippling caused by the disease, but also the interference with pleasure and education, entailed by long confinement indoors. Where there is no reasonable prospect of recovery with a useful limb, amputation must not be too summarily set aside.

FIG. 52.



Chronic descending osteomyelitis after excision of the hip. The cancellous tissue is nearly all gone, and the medulla filled up with granulations. A sheath of new bone is seen overlying the compact layer of the shaft. Amputation was performed six months after the excision. John M., case 18.

There is little doubt that, in cases of extensive disease where the femur is necrosed for a long distance and the powers of the patient are inadequate to repair it, in cases where descending osteomyelitis occurs, and in cases where profuse discharge and amyloid disease comes on, amputation should be performed. (*Figs. 33 and 52.*)

In cases of more advanced amyloid disease, unless the powers of the child are so enfeebled that the operation will

prove fatal by shock, it ought also, I think, undoubtedly to be done.

In another class of cases the question is more difficult. Where there is disease of the pelvis, is amputation contra-indicated if other conditions require it? I would answer yes, if the pelvic disease extends so widely that there is no hope of removing it all, and the condition is one of caries and not necrosis. Where there is caries limited to the neighbourhood of the acetabulum, where there is necrosis, or where there is reason to think that the disease in the limb is preventing repair in the pelvis, I would advise amputation. I believe, however, that there is a promising future for much more extensive pelvic resection than is usually attempted. In extensive pelvic disease, involving the whole thickness of the bone, a dense fibrous wall is developed on the inner aspect, which shuts off and supports the pelvic organs, and removal of a whole innominate bone would be neither impracticable nor, on this ground, dangerous. In one instance (case 28) I removed nearly one-half of the pelvis, except the symphysis pubis and the immediate neighbourhood of the sacro-iliac joint, and I learnt that the danger lay in profuse oozing of blood and not in any mechanical difficulty. In this instance I ligatured the external iliac artery before amputation, but in a future case I should be inclined to ligature the common iliac and then extirpate the innominate bone.

Again, in earlier stages of the disease, taking into consideration the tendency of the bone lesion and the actual results of treatment, we have two problems to solve—first, which will save most lives? second, if amputation is likely to save life, is it justifiable or obligatory to perform it?

Mr. Macnamara speaks more freely of amputation at the hip than, I think, other authors. His opinion is that "cases of morbus coxarius, which have resisted all our efforts to relieve the symptoms from which the patient suffers, are, as a rule, better treated by amputation at the hip than by resection of the diseased bone," on the ground that disease of the pelvis and lardaceous disease probably exist. On

the other hand, especially in young children (under six), where there is no evidence of lardaceous disease, he advises excision. In adults, he says, excision is less satisfactory than amputation. I would rather say amputation should always take the place of excision after puberty.

Mr. Barwell states his belief that the cause of failure after excision is most frequently osteomyelitis of the femur, and says elsewhere that such a condition is one requiring amputation if any operative treatment is to be adopted (*vide Fig. 52, case 18*).

As to the question of saving life, amputation at the hip performed with due precautions as to hæmorrhage and shock, and special care during the first twenty-four hours, is not a very fatal operation in children, and by those who have most often performed it it seems that this view is taken. I cannot but believe that amputation at the hip would give us a very large proportion of healthy lives, probably larger than our present results. It is true that Gant records that out of forty-two cases of amputation for chronic disease eighteen died, but many of these were in adults.

I have myself amputated in seven cases. In six excision had been previously performed. Six of these recovered well from the operation; one died of hæmorrhage (*vide case 28*).

The plan I employed, and I think it is the best, is the oval incision of Furneaux Jordan; the excision wound should be utilised, and the line of section brought as far as possible from the anus and vulva.

It is not a question suited for discussion here what the various methods of operation are, nor the best means of controlling bleeding. Elevating the limb before operation, and digital pressure with the help of an elastic tourniquet in the early stages of the operation, are, I think, as efficient means of controlling the hæmorrhage as any; in several cases I have ligatured the femoral or external iliac as a preliminary, and I think well of this plan.*

* Davy's lever I have not tried.

If possible, it is, as pointed out by Mr. Shuter, well to preserve as much periosteum as possible; and it will be found that after excision the bone usually very readily separates from the periosteal sheath; a longer, firmer, and possibly mobile stump may be thus obtained.

Recently, Mr. Marshall, of Nottingham, and others have specially advocated amputation, and it is now generally admitted that failing excision, or in cases unsuitable for it, amputation is the right course (*vide* cases in the Appendices).

CONCLUSIONS.

1. The hip joint in childhood is commonly subject to two affections: (*a*) simple synovitis; (*b*) tubercular disease.

2. Simple synovitis is usually traumatic, very rarely suppurates, is amenable to ordinary treatment, and as a rule leaves behind no bad results.

3. Tubercular disease, or common "hip disease," affects primarily the upper end of the femur, or occasionally the acetabulum, and produces necrosis or extensive caries.

4. In the early stage of hip disease, before caseation of bone or suppuration has taken place, proper treatment will, in a fair proportion of cases, result in recovery with a nearly perfect limb.

5. As soon as suppuration occurs, it is certain that recovery will not take place without destruction of the upper epiphysis of the femur more or less completely.

6. The process of removal of the diseased bone without operation is so slow, so exhausting and so uncertain, that it should be reserved for those cases where time and care can be fully devoted to it.

7. Unless absolute rest and treatment for two years can be ensured, excision of the upper end of the femur should be performed as soon as suppuration, or other evidence of necrosis is present.

8. A case of hip disease, seen before suppuration has occurred, is best treated by the use of a Thomas' splint with or without previous straightening by extension.

9. Excision of the hip cuts short the disease, relieves pain, and gives a better limb than the average result obtained without operation.

10. Excision should be looked upon as an ordinary operation for necrosis, and is not necessarily attended by a higher mortality than sequestrotomy elsewhere.

11. Excision in old pelvic disease, or where the health is broken down, or the patient is over fifteen years, should be rejected in favour of amputation.

12. The presence of a sinus after operation, unless there is much discharge or evidence of extensive pelvic disease, does not imply failure of the operation.

13. The presence of an abscess after a long period of quiescence without other evidence of relapse, (residual abscess), is not to be looked upon as of serious import.

[NOTE.—While correcting these proof sheets, I have had the opportunity of seeing the latest work on *Diseases of the Joints*, by Mr. Howard Marsh. In speaking of hip disease, Mr. Marsh puts the mortality in cases treated (by continued rest) at 5 per cent, and even in cases with abscess at 6 to 8 per cent, while the death rate from the operation of excision itself in advanced disease is at least 10 per cent (pp. 317 *et seq.*). I can only account for Mr. Marsh's opinions by supposing, first, that he has been exceptionally fortunate in getting cases at a very early stage; secondly, that his experience of excision has been more unfavourable than my own; and thirdly, that he has had the advantage of being able to treat cases for an indefinite time at the Alexandra Hip Hospital, whereas in general hospitals it is impossible to occupy beds for any prolonged period with chronic hip cases. In short, that Mr. Marsh bases his opinions rather upon the conditions to be met with in private than in hospital practice.]

CHAPTER VIII.

CAUSES OF DEATH.

SOMETHING has already been said as to the cause of death in hip disease, but it may be worth while to state it shortly here.

In cases that die without open wounds acute tuberculosis, chiefly tubercular meningitis, is a common cause of death, but acute cases may rapidly die from septicæmia or shock if unrelieved.*

Cases in which an open wound exists die usually of exhaustion, hectic or lardaceous disease, especially if the pelvis is carious. A certain number die of septic diseases, pyæmia, erysipelas, etc.

Intercurrent fevers or pulmonary diseases carry off a number of patients weakened by the joint disease, and in some nephritis, other than amyloid, proves fatal. I have several times seen cases of temporary hæmaturia in children, especially in those suffering from disease of the bones, a considerable quantity of blood is passed for a few days or longer, and then albuminuria persists for a short time and they get well; no bad result seems necessarily to follow. In three cases of hip disease this has occurred; there has been no assignable cause, no scarlatinal infection, and no known exposure to cold or other source of acute nephritis. It is sometimes, but certainly not always, I think, due to carbolic irritation.

Hæmorrhage from sinuses has been recorded as a source of danger if not of immediate death by Mr. Hussey, of Oxford. I have also had a fatal case (case 62), and seen

* Albrecht found that 48 per cent of the deaths from joint diseases were due to tuberculosis.

severe bleeding in another (case 74). In 1879, Dr. Tanner, of Hereford, recorded a case of cardiac embolism following thrombosis of the femoral vein in hip disease.

Shock, carboluria, and persistent vomiting sometimes cause death after operation, but have no special relation to the hip. Pyæmia has probably a greater number of victims in excision of the hip than in other cases, for the cut surface of the femur is often exposed in anything but a healthy cavity, and absorption is likely to occur.

Of my own one hundred cases, fifteen are known to have died. Of these, two had pyæmia at the time of excision, and the operation was performed merely as a means of drainage (cases 6 and 11), one of them had carboluria. One child died in forty-eight hours, of shock (case 98). One died of hæmorrhage from cellulitis and ulceration into the femoral artery (case 62). Three became generally tuberculous, and died from two to four months after operation (cases 17, 63, 85). Five died at times varying from six months to four years after operation, from progressive mischief or lardaceous disease (cases 3, 19, 21, 29, 30). One was dying at the time of operation (case 94), and lived for fourteen days only. One died from hæmorrhage after amputation (case 28); and in one instance the cause of death, which took place two years after operation, is unknown (case 39). An examination of these cases will show that in only two instances did death result directly from the operation—a mortality by no means prohibitory (*vide* cases and table). On the whole probably most of the deaths in hip disease are due either to tuberculosis, meningeal or other, or to gradual exhaustion from prolonged suppuration.

CHAPTER IX.

OTHER DISEASES OF THE HIP.

BRIEF mention only can be made here of some of the other morbid conditions met with in the hip in children. "*Acute suppurative arthritis of infants*" is a disease first described by Mr. T. Smith, of St. Bartholomew's; since then attention has been drawn to the subject by Mr. Morrant Baker, Mr. John Poland, the present writer,* and others. The affection is a remarkably well defined one, and of fairly frequent occurrence. It is limited usually to children under a year old, and attacks the hip joint more frequently than any other articulation. Out of about a dozen cases I have had under my care, the hip has been attacked alone or in conjunction with other joints in nine instances.

Pathologically the disease is an acute epiphysitis leading to rapid destruction of the ossifying centre of the bone it attacks with perforation into and destruction of the adjacent joint. In the knee a similar condition, but without evidence of bone lesion, may be met with (pyæmic synovitis).

A large number of the infants so attacked die, chiefly of pyæmia; nearly half the cases I have seen proved fatal.

There is usually no obvious exciting cause, though injury may produce it. I have seen a case in which it arose *in utero*. Sometimes it is a secondary pyæmic condition. It may run a very acute course or last for several weeks, or even a few months; in the more chronic cases the prognosis is better.

The characteristic symptoms are the age and great swelling, often involving the whole limb, not uncommonly "flying about," *i.e.*, one limb becomes swollen and subsides,

* *Lancet*, 1881.

and then the disease becomes localised in perhaps the opposite leg. In acute cases the temperature runs very high. Erysipelas and acute periostitis are the diseases it is most often mistaken for.

The treatment consists in free incision and abundant food and stimulation. In cases that recover there is usually good mobility, but some weakness and shortening. I have seen older children with weak limbs clearly due to this disease having occurred in infancy (*vide* cases 24 to 31, Appendix ii.).

SYPHILITIC DISEASE OF THE HIP.

Syphilitic joint disease rarely occurs in the hip; when it does it takes one of two main types—the ordinary syphilitic synovitis met with in late secondary* and tertiary states of acquired syphilis, and the *Syphilitic Telostitis* occurring as a result of congenital syphilis. The former is marked merely by the symptoms of a subacute synovitis occurring in a syphilitic subject, and is amenable to anti-syphilitic treatment, and to that alone.

I have not seen a case of syphilitic telostitis in the upper end of the femur; it consists of a gummatous infiltration of the epiphysial cartilage and neighbouring bone producing thickening and having a tendency to cause separation of the epiphysis. This, too, is to be met by antisymphilitic remedies, chiefly mercury and the maintenance of the limb in good position. It is often multiple, not always symmetrical, not acutely painful and not prone to suppurate, though I imagine it would very likely do so if it attacked the hip.

Hip disease may, of course, occur in its ordinary form in the subjects of congenital syphilis, but I have seen only one or two cases, and they ran much the usual course.

* It is possible that the synovitis of secondary syphilis may be due to a syphilitic eruption on the synovial membrane exactly comparable to those on skin and mucous membrane, but I am not aware that the fact has been ascertained by examination.

*HIP DISEASE BY EXTENSION FROM OSTEOMYELITIS
OF THE SHAFT OR FROM PERIOSTITIS.*

It has been already pointed out that disease of the hip joint is produced usually by extension from the epiphysis or the adjacent part of the diaphysis; it may, however, be set up by extension from more distant parts of the shaft, as shown in *Figs. 2 and 33*, where a primary osteomyelitis of the shaft extended to the joint and produced destruction of it. Such a condition is rendered more probable by the anatomical arrangement already alluded to of the diaphysis entering into the formation of the articular part of the head. The fact that disease does so extend affords additional reasons for the practice usually adopted of exarticulation in these cases.

Two cases are on record in which an acute periostitis of the shaft of the femur has led to destruction of the joint. One by Mr. Bryant, brought before the Clinical Society, and one the notes of which my colleague, Mr. Jones, has kindly allowed me to use (*vide* case 15, Appendix ii.),* where the upper epiphysis of the femur became detached and was discharged.

In Mr. Bryant's case, though the head and half the shaft were removed, recovery took place with only 1 inch shortening.

*INTERSTITIAL ABSORPTION OF THE NECK OF
THE FEMUR.*

Bell and Liston, and later Gulliver, described cases where in young people, even as early as thirteen years old, atrophic changes have taken place in the neck of the femur after injury. The patient after a fall on the hip gradually becomes lame. The lameness may not come on for some time after the injury, as in one of Gulliver's cases; there is generally some but often not a great amount of pain. On examination the limb is found to be shortened, mobility is

* Already mentioned on page 69 *antea*.

usually free, and the shortening is progressive. The shape of the head of the bone is altered, it becomes flattened, and corresponding shallowness of the acetabulum is found. Apparently the injury sets up some chronic atrophic changes, probably akin to the inflammatory condition known as "caries sicca" (*vide* case 14, Appendix ii.). In some cases there is an extension of the inflammatory condition to the joint itself, and softening of the ligaments leading to dislocation; in such circumstances the amount of mobility is diminished. In two other cases I have seen there was but slight stiffness. There may or may not be thickening of the bone, and in one case Gulliver describes sclerosis. In one of his specimens the ligamentum teres had been torn. The width of the body between the pubes and the trochanter on the diseased side is diminished. Rest, with subsequent passive movement, and later the use of a thick-soled boot, is all that can be done.

HYSTERICAL HIP DISEASE.

The hip is one of the joints most frequently affected by this condition. Its characters, for an account of which I am indebted largely to Mr. Barwell's book, are as follow:

Pain.—Pain is described usually as being very acute, is usually diffused widely over the buttock and sometimes over more distant parts, but is rarely assigned to the spots in which it is found in real morbus coxæ. The tenderness and pain on movement are such as are only found in severe acute disease, and yet locally no inflammatory conditions are present. Pain is usually superficial. Night pains are absent—*i.e.*, true starting night pains.

Posture.—The posture is usually that of the third stage, though the local condition is such as generally exists in the first or second stages.

Spasm.—There may be muscular rigidity, but distracting the attention will often enable the movements of the joint to be freely performed. There is often rigidity of the knee as well as the hip.

Swelling is absent, and there is no thickening of the trochanter.

Age.—The age of these patients is greater than that at which hip disease usually occurs.

General condition is that of health, and there is no wasting of the limb, or only such as is attributable to lack of use. There is usually other evidence of hysteria.

Treatment is that of other hysterical conditions, encouragement to use the limb, occupation to distract the patient's mind from it, and entire abstention from any acquiescence in invalidism, with perhaps a blister or galvanism. A typical case will be found in No. 23, Appendix ii.

CONGENITAL DISLOCATION OF THE HIP.

The so-called congenital dislocation of the hip is a tolerably common condition. Mr. Adams* considers it is a condition of malformation of the acetabulum with displacement of the head of the femur. Movements in such cases are free and painless; the patients can walk, but with a peculiar waddling gait and alternate dropping limp of each leg, when the malformation is double, due to the thrusting up of the femur above the acetabulum, and its again falling when pressure is removed. Mr. Adams says it may produce pelvic deformity. The upper end of the femur feels during life as if it were deformed, and the normal outline of the round head cannot be felt.

Mr. Howard Marsh, who has seen nearly thirty cases, and from whom I quote the following, writes of it as much more frequent in females than males (as eleven to three). It is often double, but generally unilateral. In some cases, he says, "the head of the femur is nearly normal, while in others it and the chief part of the neck are absent, so that the bone ends above in a mere stump. In adult cases which have been dissected 'the acetabulum has been found small and shallow, and webbed over by loose fibrous tissue.'

* *Brit. Med. Jour.*, Nov., 1885.

In some cases the femur is so loosely connected with the pelvis that it slides about on the dorsum ilii, so that the limb can be lengthened or shortened through a range of as much as three inches; but in many more it is fixed, by a kind of interosseous ligament and perhaps a capsule, to some point above or above and behind the natural situation of the acetabulum. The affected limb, whether on one or both sides, is always rather undersized, often short independently of displacement and defective in muscular development, but all these deficiencies may be very slight. Lameness is always considerable, the patient, when the displacement is double, walking with the peculiar 'roll' that has been so often described, with a 'drop' towards the affected side when it is single. Forward curvature of the lumbar spine—*lordosis*—is usually well marked. The limbs commonly occupy a normal direction, the heel comes down to the ground and the toe points forward without inversion or eversion of the limb, though in rare instances of double displacement the thighs are so much adducted that they tend to cross each other in walking, and the patients with their heels drawn up balance themselves on the ball of the toes.

"If the upper end of the femur be loose, the limb may be drawn down to greater length than its fellow, and then pushed up till it is considerably, often 2 inches, too short. All movements of the joints are perfectly, perhaps abnormally free, except abduction, which is generally somewhat limited. The great trochanter of the femur can be felt to be displaced, and may occupy any position upon the dorsum ilii, either gliding freely or being fixed above, and a little behind, or directly above the normal situation of the acetabulum, or close to the anterior superior iliac spine, where I have found it in three or four cases."

The ligamentum teres, according to Barker, may be absent or elongated. In Bennett's case, the gluteus maximus was much wasted, the capsule thickened, not perforated and normally attached, the acetabulum was filled with fat. The seat of the new joint was above and

behind the old socket, there was no new bone around it, the ligamentum teres was atrophied and flattened on one side and reduced to a mere thread on the other, probably as the result of atrophy from pressure (*vide Medical Times and Gaz.*, Feb., 1884; *Dublin Jour. of Med. Sci.*, Jan., 1885).

There is little to be done for these cases, though it is recommended that the limb should be supported and fixed in a state of extension; and it is said that a certain amount of increased stability in the joint may result. Beyond the ungainliness of the walk, however, the affection produces little ill result, except, possibly, as suggested by Mr. Adams, from an obstetric point of view, in the deformity of the pelvis.

Brodhurst* has practised section of the muscles surrounding the hip, and he claims to have had good results; in other cases excision has been done. Neither plan will, I think, come into general use; while extension in bed I have found to do harm rather than good. When unilateral a thick-soled boot should be worn on the shorter limb, when symmetrical no treatment is advisable.

The history of the case, the absence of pain and rigidity, and the peculiar gait serve to distinguish the affection from hip disease. When the dislocation is bilateral there is little likelihood of error, though it is interesting that in a case of double excision of the hip of my own the appearance of the child closely resembled that of double dislocation (*vide* case 74, also *Fig. 41*).

I have seen many of these cases and have noticed that they vary much in the degree of deformity. When once on the look-out for the affection there is little likelihood of mistakes in well-marked cases, though in slight degrees there is a great resemblance to certain cases of rickety lordosis.

* *St. George's Hosp. Repts.*, 1866.

TABLE I

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint time of Oper.
Case 1	Alfred Dalton	7½	June, 1881	Phthisical history	Fall	Sept. 30, 1881	Abscess
Case 2	James T. Entwistle	4½	Early in 1881	None	None	Sept. 30, 1881	Abscess
Case 3	John May	9	Early in 1879	None	None	May 26, 1881	Abscess
Case 4	Emily J. Howard	5	April, 1880	Always delicate	Fall	Left side Aug. 12, 1881	Double b disease; p in left joint
Case 5	Fanny Ashton	4½	April, 1880	Measles	None	Oct. 13, 1881	Abscess
Case 6	Hannah Hopkinson	9½	Oct., 1880	None	None	Aug. 18, 1881	Joint incised contained to serum and lymph; cartilage loose, July 1881
Case 7	Emma Thomas	8-8	Early in 1879	None	None	Aug. 11, 1881	Abscess joint; cartilage loose
Case 8	Albert E. Drinkwater	8	1876	None	None	Nov. 10, 1881	Old healed sinuses; in position, in which osteotomy done; free mischief followed

EXCISIONS.

State of Acetabulum.	State of Femur.	Result and when last seen.
No record	Epiphysis caseous and partly gone; subchondral caries; erosion of cartilage	Two sinuses, 1½ in. shortening; stiff, anæmic, growing fast, Feb., 1884. Feb., 1885, doing well.
Much diseased	Artic. cartilage in parts gone; upper epiphysis half destroyed; diaphysis rarefying osteitis	Dec. 15, 1881, fat and well, but still sinus; walks with crutches and patten. Sinuses nearly all closed; limb somewhat flexed; general health very good. Oct. 13, 1882.
Caries and necrosis	Articular cartilage gone; a deep carious pit at site of lig. teres	Still sinuses, but general condition good. Oct., 1885, lardaceous, dying.
No record	Necrotic cartilage; cavity in neck	Nov., 1881, still sinus; gets about with patten and crutches. March, 1883, doing well.
Cartilage gone	Upper epiphysis all gone, and most of epiphysal cartilage; cavity in neck	Nov. 27, 1881, wound not healed, general condition good; doing well; walks with limp, March 20, 1883. Feb., 1885, heard of, doing well.
Cartilage loose	Articular cartilage all gone; epiphysis caseous; shaft inflamed	Had septicæmia and carbouluria. Died Aug. 24, 1881.
No record	Necrosed cartilage; inflamed epiphysis	1885, still a sinus in front; fat and well; gets about with crutches and patten. May, 1886, 1½ in. functional, very little actual shortening; mobility through 40 deg.; good power; still a sinus; can walk. Oct., 1886, unhealed.
Pelvis perforated; good deal of diseased bone	Head of bone nearly gone, remainder pale and sclerosed	Dec. 15, 1881, is anæmic, but doing fairly well; gets about with patten, &c. Feb., 1883, still sinuses, and is pale, but in good position. May, 1885, one sinus, hardly any discharge; neglected, and is flexed and adducted and stiff, but walks well; has a little pain in knee in wet weather.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint time of Oper.
Case 9	Julia Cumming	1½	Early in 1881	None	None	Sept. 30, 1881	Abscess
Case 10	Elizth. O'Neill	5-2	June, 1878	None	None	June 30, 1881	Sinus
Case 11	Joseph P. Hardacre	4½	Feb., 1881	Phthisical history	Injury	April 30, 1881	Joint incised April 12; badly
Case 12	Mary M. Barker	7	Aug., 1881	None	Fall	Sept. 30, 1881	Abscess; epiphysis loose
Case 13	Ellen O'Grady	10½	Sept., 1880	"Strumous;" acute periostitis of opposite tibia a year ago	None	Nov. 1, 1880	Abscess; epiphysis loose
Case 14	Thomas Mercer	4-1	March, 1880	None	Fall	Oct. 13, 1881	Sinus
Case 15	Alice Mottram	5-11	May, 1880	None	Fall	Nov. 25, 1881	Sinuses
Case 16	Elizth. Devney	11-2	Nov., 1874	None	None	Nov. 24, 1881	Abscess
Case 17	Willie Jackson	5	Spring of 1880	None	None	March 10, 1881	Joint incised Feb. 19, 1881; caseous matter in
Case 18	John Moseley	11	No record	None	None	Oct. 30, 1880	Abscess

State of Acetabulum.	State of Femur.	Result and when last seen.
No record	Epiphysis caseous; cartilage loose; epiphysis nearly separated	Nov. 20, 1881, little discharge; wound healthy; does not gain ground. March 27, 1883, fat and well, but sinuses; $\frac{1}{2}$ in. shortening.
Sequestra and perforation	Head and neck of femur represented by a small necrosed bottom of bone	Dec. 15, not doing very well; hectic. June, 1882, all wounds except one healed, two sequestra were taken from this; general condition good; $\frac{3}{4}$ in. shortening; nearly stiff.
Healthy at time of operation	Articular cartilage gone	Died of pyæmia with extensive pelvic necrosis. May 15, 1881.
Extensive disease	Epiphysis, a loose hard sequestrum	March, 1885, soundly healed; good mobility; can stand on bad leg alone; $\frac{1}{2}$ in. short from drawing up; not arrest of growth; can walk.
No record	Epiphysis, a loose hard sequestrum	Oct. 11, 1881, wound superficial; $\frac{3}{4}$ in. shortening; free mobility. May, 1883, can almost walk; healed; good mobility; $\frac{3}{4}$ in. short. March, 1885, much the same. July 25, as above, fat and well; two sinuses. A big well-grown girl; active mobility through 60 deg.; nearly $\frac{1}{2}$ in. functional and $\frac{3}{4}$ in. actual shortening; has an abscess and some scars about the other hip; walks about well without any support.
Diseased; gouged	Head of bone almost gone, soft and carious as far as neck	1885, had quite healed, but walked too much and some discharge followed; is almost well again. Oct. 2, 1885, fat and well; fixed; one superficial sore.
"Inflamed"	Upper epiphysis entirely gone; bone below pale, with hyperæmic patch in it	Heard of 1885. Healed and gets about without any apparatus.
Sequestra	Remains of neck and upper part of shaft caseous	1885, still unhealed, but steadily improving; general condition good. Oct. 10, 1886, as above. Limb short and powerless.
Some small bits of carious bone removed	Head carious; little cartilage left	Died July 9, 1881. He had pulpy disease of same knee at time of operation, and the thigh was fractured in protruding the head of the bone; died of pneumonia and exhaustion; tubercle.
Perforated	Bone soft and breaking down; no head left	Did no good; amputation, April, 1881; fat and well in 1885, but still a little discharge.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint at time of Operation
Case 19	John J. Kirke	11½	April, 1879	None	None	Dec. 9, 1881	Sinus
Case 20	Annie Wilson	4-8	April, 1881	History good	None	Dec. 15, 1881	No external abscess
Case 21	Harriet E. Armitage	9½	Oct., 1878	Phthysical history	Falls	Jan. 15, 1881	No external abscess
Case 22	Ernest Jones	7	March, 1876	None	Fall	April 2, 1881	Abscess
Case 23	John A. Darbishire	9	Oct., 1880	None	Fall	March 25, 1881	Abscess
Case 24	Alice Pope	5½	End of 1879	None	None	Nov. 20, 1880	Sinus
Case 25	Sarah J. Naylor	10½	Before 1873	Phthysical history	None	Nov. 1, 1880	Sinuses
Case 26	Wm. J. Connor	4-7	Oct., 1880	History "strumous"	None	Oct. 21, 1881	Abscess; epiphysis loose
Case 27	Thomas James Costello	5	Aug., 1879	None	Injury	Oct. 6, 1881	Pus in joint; cartilage loose
Case 28	Thomas Ball	7-4	Aug., 1878	None	None	Aug. 17, 1882	Sinuses
Case 29	Edwin Handforth	6½	June, 1881	History good	Supposed injury	Feb. 2, 1882	Abscess
Case 30	Martha Ashtonhurst	7-7	April, 1882	History good	Fall	May 11, 1883	Abscess

State of Acetabulum.	State of Femur.	Result and when last seen.
Diseased	Cartilage necrosed and loose ; bone very soft	Died March, 1883. Amputation was advised but refused.
Bare	Upper epiphysis half absorbed ; remains carious on both sides of epiphysial line	Feb. 19, 1882, sinuses still unhealed ; sent out in Thomas' splint.
Rough	Subchondral caries	Did fairly well for a time, but died of pelvic disease. July, 1881.
Rough ; was gouged	Head carious	June 16, 2in. of diseased femur were removed ; was heard of up to Oct., 1882, when he was getting about ; wounds nearly healed.
No record	Head carious	Dec., 1881, feeble and anæmic ; much thickening about femur ; 2in. shortening ; has been neglected at home.
A bare spot	Head all gone	Feb. 7, 1881, all healed ; 2½in. short. Nov., 1881, good power and mobility ; 1½in. short. Dec., 1881, a superficial discharging spot. Feb., 1882, the hip which had been soundly healed had again broken down.
Perforated sequestra	Head and neck entirely gone ; sequestra	Jan. 29, 1881, amputation. Dec., 1881, wounds not healed, but general condition fairly good. Oct., 1885, still sinuses.
Largely perforated	Epiphysis of head loose	Discharged in June, 1882, in bad condition.
Granulation lined	Epiphysis partly absorbed and sclerosed	Feb., 1883, in a union infirmary, in bad position, with no apparatus and numerous sinuses.
Sequestra	Epiphysis caseous and cheesy patches below epiphysial line ; greater part of head gone	In Oct. had erysipelas. Nov. 2, amputation and removal of much of pelvis ; died directly after operation.
Much diseased	... ..	Feb., 1883, is apparently dying of lardaceous disease.
No record	Head mostly gone ; caseous bone extended to epiphysial line, also to trochanteric epiphysis ; another yellow patch below epiphysial line ; bone around hyperæmic	Died exhausted March, 1885.

ON HIP DISEASE IN CHILDHOOD.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint at time of Operation.
Case 31	Edward Fido	6	Oct., 1884	None	None	May 7, 1885	None
Case 32	Thomas Buckley	9-5	June, 1882	History tuberculous	Injury	July 19, 1883	Sinus
Case 33	Mary Howard	4-11	March, 1880	Diarrhoea	None	Nov. 23, 1882	Abscess
Case 34	William Roberts	10-6	1874	None	None	Aug. 1, 1883	Sinus
Case 35	James E. Carter	7-1	July, 1881	None	None	Jan. 11, 1883	Abscess
Case 36	William Marsh	8	...	Phthisical history	None	July 23, 1883	Abscess
Case 37	John Robinson	4-1	Sept., 1882	None	Injury over-use	May 19, 1883	Pus in joint
Case 38	Andrew Haigh	6-7	Sept., 1880	None	None	March 22, 1883	Abscess

State of Acetabulum.	State of Femur.	Result and when last seen.
Healthy	Cartilage a little thinned; beneath is a narrow congested zone; below this bone anæmic throughout half the epiphysis	Doing well, May 12, 1885. Superficial, June, 1885. Oct. 20, 1885, healed; mobility through 60 deg.; no pain; straight shortening $\frac{3}{4}$ in. functional, none actual; can stand on it. June, 1886, functional shortening $1\frac{1}{4}$ in., actual nil; straight; good mobility; fat and well. July, 1886, walks excellently with $1\frac{1}{4}$ in. sole on bad leg.
Bare and excavated	Head and neck of bone almost gone; a small sequestrum; a spot of disease in trochanteric epiphysis also in shaft; epiphysal cartilage nearly gone	Jan., 1884, is well; $1\frac{1}{4}$ in. shortening; fat and well; mobility through 45 deg. Feb., 1885, has a little discharge from three sinuses, otherwise as above. Sep. 29, 1885, one sinus only. June, 1886, fat and well; one sinus unhealed above Poupert's ligament; mobility through about 30 deg.; walks well. Nov., all sound.
Fairly healthy	Head of femur caseous	Oct., 1883, sound and well; mobility to right angle; $1\frac{1}{4}$ in. shortening due to pushing up of femur, not arrest of growth. Feb., 1885, as above. May 19, 1885, as above; shortening $1\frac{1}{4}$ in. functional, actual $\frac{3}{4}$ in.
Diseased, some bone removed	Head largely destroyed	Jan., 1884, strong and well; $\frac{3}{4}$ in.— $1\frac{1}{2}$ in. shortening. Feb., 1886, sound and well; some adduction; $2\frac{3}{4}$ in. functional, $2\frac{1}{4}$ in. actual shortening.
No record	There was grating in the joint	Feb., 1884, hip nearly healed, but has disease of elbow. April, 1885, elbow has been excised; hip nearly well, but is tuberculous, and going down hill.
Largely perforated; sequestrum	Half of head gone; all carious; no disease below epiphysal line	Jan., 1884, sinuses puckering in; little discharge; is fat and well. Feb., 1885, as above. Oct. 13, 1885, not much discharge; gets about with patten and crutches.
No record	A sequestrum the size of a cherry in a cavity below the line of section, and a similar one in the head of the bone	Sound and well, March, 1885; a superficial sore again appeared after too much running about. Has been neglected, April, 1885. Feb., 1886, as above.
Granulation covered	All cartilage gone from head, which is rough and excavated	March, 1885, had quite healed, but was not careful, and a little discharge re-appeared; is fat and strong. Oct., 1885, sound and well; fair mobility; stronger; gets about with patten and crutches. April, 1886, sound; good mobility; can walk. Later on, hurt it and a sinus formed. Oct., 1886, almost well again.

ON HIP DISEASE IN CHILDHOOD.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint time of Oper
Case 39	Eliza T. Rhodes	4-11	Before 1882	None	None	Feb. 3, 1883	Absces
Case 40	Jane Hughes	7-8	Dec., 1882	Phthisical history	Injury	Feb. 14, 1884	Absces
Case 41	James Parrin	4-1	Oct., 1883	Phthisical history	None	Feb. 17, 1884	No Absc
Case 42	Mary E. Sadler	7-2	April, 1882	History good	Fall	Nov. 19, 1884	Absces
Case 43	Catherine Shaw	6-11	Jany., 1882	None	None	March 27, 1884	Absces
Case 44	George Roberts	2	Nov., 1883	Measles	Fall	June 26, 1884	Absces
Case 45	Fred Lomas	8-2	Nov., 1879	Phthisical history	Fall	Nov. 30, 1883	Absces and Sin
Case 46	James Bowker	8-7	June, 1881	Phthisical history	None	Nov. 30, 1883	Absces
Case 47	William Tate	5	Feb., 1882	Tubercle in lungs ? secondary	Fall	Feb. 28, 1884	Absces

State of stabilum.	State of Femur.	Result and when last seen.
Eroded	A pulpy cavity in the femur	Heard of as having died in 1885.
Rough	Head partially destroyed; lower and under part, including part of diaphysis, eroded; part beyond mottled; in parts rarefied; in others anæmic	August, 1884, almost healed; general condition good.
No record	Subchondral caries; cartilage thinned; epiphysis pale, hard, and rather transparent looking	March, 1885, healed. April, 1886, sound and well, straight; good mobility; can walk on it alone.
Sequestra	Most of femoral epiphysis gone	April, 1885, wound almost dried up; condition good; mobility through 75 deg.; shortening 1½ in. functional; none in femur; straight; fat and well.
No record	No record	Feb., 1885, sound and well; in good condition; walks. May, 1886, had a fall recently, and some fresh discharge, but is almost well again; 2 in. functional, 1½ in. actual shortening; walks well; no mobility; a little flexion; is pale and thin.
Granulation lined	Cartilage over head smooth, but rather red and mottled; bone healthy	July 19, 1884, healed; ½ in. shortening. March, 1886, walks well; ½ in. actual, 1 in. functional shortening; mobility nearly perfect; good position; walks well; can stand on it alone.
Healthy	Part of head gone; one or two caseous patches with hyperæmic bone round; at line of section, bone soft	Feb., 1885, healed to a superficial sore; general condition very good. May, 1886, 2 in. functional and nearly the same actual shortening; a superficial sore; can walk; almost full mobility, and good power.
Sequestra	Head of bone nearly all gone; disease extended below epiphysial line	Feb., 1885, sound and well; 1½ in. shortening, entirely from pushing up of femur; mobility fair; walks for ten minutes daily. May, 1886, 2 in. functional, 1½ in. actual shortening; sound and well; mobility through 10 deg.; a little flexion; walks well. Nov., 1886, all well.
Very soft	Bone very soft; epiphysial cartilage loose; soft granulation patches in diaphysis; trochanteric epiphysis diseased; shaft below section quite soft and rarefied	Feb., 1885, healed. April, 1885, again a superficial sore. Oct., 1885, fat and well, except cornitis; a small superficial sore over hip; fair mobility. July, 1886, a superficial sore; 2½ in. functional, 1½ in. actual shortening; perfect mobility and good power; walks on tiptoe; is well. Oct., 1886, has a little synovitis of the same knee.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	9 in
Case 48	Herbert Chadwick	7	Sept., 1882	None	Fall	Nov. 6, 1884	
Case 49	John Buckley	4	Nov., 1883	None	None	Feb. 21, 1884	
Case 50	Fred W. Burrows	2-8	Nov., 1883	Measles	None	June 19, 1884	
Case 51	Alice Rose	4-6	Sept., 1883	Otorrhœa 12 months ago	None	Oct. 23, 1884	
Case 52	Mary Fort	4	April, 1883	None	Fall	Jan. 10, 1884	
Case 53	Matilda Harris	7-9	About April, 1880	None	None	Oct. 11, 1883	

L	State of Femur.	Result and when last seen.
	Disease both above and below epiphysial line; subchondral caries; small sequestra on surface of neck. Jan., 1886, some mobility; no pain; $\frac{1}{2}$ in. functional, no actual shortening. Feb., 1886, has had some pain and discharge	Jan., 1885, still sinuses and much thickening; general condition good. June 30, 1885, sinuses closing and shrinking; no pain; thickening less; in Thomas'; fat and well. Oct. 13, 1885, one sinus; splint off; all well. Dec., 1886, unhealed.
	Subchondral caries; bone mottled. Disease in femur in early stage	July, 1884, an abscess in front of excision wound and a good deal of glandular enlargement. May, 1885, small superficial sore; good mobility; $1\frac{1}{4}$ in. functional shortening; none in femur; fat and well. May, 1886, a sinus; can walk very well and stand on it alone.
	A sequestrum in the bone below the line of section; epiphysis healthy except just adjoining the epiphysial line at one point; below this a large carious granulation area enclosing three hard loose sequestra; disease chiefly at inner part of neck; cartilage yellow and rough	Feb., 1885, very slight serous discharge; in good condition. June 30, 1885, sound and well; not walk yet. Oct., 1886, heard of as being in good condition. Nov., 1886, still a sinus.
	Bone mottled above and below epiphysial line; subchondral caries; cartilage quite loose, and in one spot perforated	Feb., 1885, hip sound and well. April, 1886, all healed but a small residual abscess; can walk; $1\frac{1}{2}$ in. functional, very little actual shortening. Oct., 1886, 2 in. functional, 1 in. actual shortening; can walk a little; residual abscess larger.
n	Head almost gone; bone below hyperæmic and rarefied; a patch of sclerosis at lower and inner part of neck	June, 1884, wound unhealed; flabby; general condition poor. June, 1886, all soundly healed; fat and well; straight; fair mobility, about 45° and some lateral movement; not much power yet, and cannot walk much; shortening, $\frac{1}{2}$ in. functional and actual. Nov., again a sinus.
	Head of bone rough and bare	Jan., 1885, healed; general condition very good. Oct., 1885, superficial sore again; has been doing too much. June, 1886, not quite healed; 1 in. actual, 3 in. functional shortening; almost perfect power and mobility, except abduction; is straight, and walks well. Oct., 1886, as above, almost dry. Dec., still a sinus.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.
Case 54	Ernest Taylor	8	Nov., 1883	None	None	Nov. 14, 1884
Case 55	Susan Moores	10	.....	None	None	June 1, 1884
Case 56	Albert E. Collier	7	May, 1882	None	None	May 28, 1884
Case 57	Herbert Lingwood	6-4	March, 1881	Phthisical history	Fall	April 4, 1884
Case 58	Lucy McClelland	5½	Jan., 1883	None	None	June 9, 1884
Case 59	William Harvey	4-10	Aug., 1881	None	Scarlet fever	Jan. 19, 1884
Case 60	Robert Beckett	7	Nov., 1882	None	Injury, scarlet fever	July 12, 1883
Case 61	Phœbe Ogden	8-11	Nov., 1876	None	None	Jan., 1883

State of etabulum.	State of Femur.	Result and when last seen.
are and rough	Bone mottled; cartilage thinned and eroded; a patch of disease in the shaft	Feb., 1885, still sinuses but very little dis- charge; general condition fair. Oct. 10, 1885, two sinuses; others healed; straight and well in self; gets about with crutches. April, 1886, all healed and sound; $1\frac{3}{4}$ in. functional, $\frac{1}{2}$ in. actual shortening; straight; mobility through 25° ; can walk alone. Dec., as above.
... ..	Cartilage of head gone; necrosed car- tilage in joint; surface of bone eroded; cancellous tissue very dark coloured	Feb., 1885, in good condition but not quite healed. April, 1885, several sinuses; condition fair. July, 1886, all sound and well; walks with limp; nearly full mobility; 1 in. functional, $\frac{1}{2}$ in. actual shortening; good power, and general health.
ensively seased, many questra, ominate t separated its three parts	Cartilage gone; bone bare and rough, mottled, sclerosed in parts soft in others; under surface of neck soft and friable	Feb., 1885, still one sinus, but discharge is very little and getting less; general condition good. Sept., 1885, as above.
Bare	Cartilage thinned but not gone; sub- chondral caries; epiphysis pale and mottled; similar patch in neck at under part	Jan., 1885, still sinuses, but doing very well. July 18, 1885, 2 in. functional, 1 in. actual shortening; sinus scabbed over for the past 9 months; not much power in limb; no pain; general condition good; to leave off Thomas'; gets about in patten and crutches.
.....	Head of bone all gone, except one small bit; a large sequestrum in upper part of shaft	April, 1885, very little discharge; sinuses puckering in and healing; general con- dition improving fast; $\frac{3}{4}$ in. functional, no actual shortening. Dec., 1886, al- most healed; walks very well.
ly good	Upper epiphysis almost gone; below epiphysal line bone rarefied in some parts, sclerosed in others	Feb., 1885, nearly healed; $\frac{3}{4}$ in. shorten- ing; in femur itself entirely; general condition good. Oct., 1885, super- ficial sore; gets about with patten and crutches. June, 1886, better, but not yet healed.
rious; forated; sestrum	All cartilage gone except "marginal zone"; epiphysis cheesy	March, 1884, amputation; did fairly, but has not healed.
ensively seased	Extensively diseased	Oct., 1885, still several sinuses; general condition fairly good. Dec., 1886, sinuses closing; can walk.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.
Case 62	John Thomas Garratt	9	June, 1879	None	Fall	Jan. 5, 1885
Case 63	Bessie Kay	6	Dec., 1882	None	Fall	Jan. 5, 1885
Case 64	Ada Wallace	7	Aug., 1883	None	None	Jan. 8, 1885
Case 65	Thomas Shaw	6	May, 1884	Family history tuberculous	Fall	Jan. 15, 1885
Case 66	Charles Lovatt (<i>Double hip disease</i>)	5	Sept. 1, 1883	None	None	Right, Nov. 27, 1884; Left, Jan. 29, 1885
Case 67	Bertha Brown	7	Sept., 1883	Whooping cough and measles two years ago	None	Feb. 26, 1885
Case 68	Albert Oakes	7	May, 1884	Tubercular history	Fall	Feb. 26, 1885
Case 69	Robert Bridge	7	July, 1884	None	Kick	March 5, 1885

State of acetabulum.	State of Femur.	Result and when last seen.
Cartilage gone; tity enlarged; one fairly healthy	All epiphysis gone, except one bit; epiphysial cartilage bare; some repair going on	Was attacked with cellulitis; ulceration took place into the femoral artery, and he died Jan. 18, 1885.
small patch of disease	Cartilage thinned and detached; bone pale to below epiphysial line	General tuberculosis; died of tubercular meningitis March 4, 1885.
Perforated	Cartilage almost entirely stripped off; bone below worm-eaten and anæmic and mottled; below epiphysis two separate centres of caseation	Doing fairly well; still a sinus; in Thomas' splint. May, 1885, general condition very fair. May, 1886, still two sinuses; is fat and well; can walk a little. Dec., has an abscess.
granulation-lined	Bone of neck hard, and pus infiltrated; pus extended down into the shaft; epiphysial cartilage replaced by granulation tissue; in epiphysis of head one caseous patch; rest inflamed, but not cheesy; disease spread in both directions from just below epiphysial line	Unhealed May, 1885.
, rough and soft; somewhat diseased	<i>Right</i> , cartilage entirely gone; bone eroded, pale, and anæmic, except at epiphysial line, where it was congested; below epiphysis bone mottled. <i>Left</i> , head pale; cartilage peeling off; some disease in shaft below section	<i>Right</i> healed; <i>left</i> a sinus; general condition very fair; in double Thomas' May, 1885. Oct., 1885, as above; does not improve. Oct., 1886, going down hill, probably lardaceous.
Cartilage loose	Head and epiphysial cartilage gone	Does not gain ground; sent to sea side May, 1885; not healed. Oct., 1885, much as above; still sinuses; otherwise better. Oct., 1886, unhealed; not doing well.
Cartilage loose	Cartilage in parts loose and thinned, nowhere perforated; subchondral caries; bone mottled at one spot close to epiphysial cartilage	Still a sinus; doing well in Thomas' splint, May, 1885. Oct. 10, 1885, still sinus, as above. May, 1886, mobility through 10 deg.; two sinuses; can walk fairly. Dec., all well.
very much diseased; perforated; questrum	Cartilage over head of bone thinned in places, and loose; subchondral caries; epiphysis pale; subepiphysial area mottled and soft; round ligament not entirely gone	Did very well up to May, 1885, when a fresh abscess formed; still in hospital. Oct., 1885, nearly healed; fat and well. Aug., 1886, all sound.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of time of Op.
Case 70	Annie Brady	10	Sept., 1883	Tubercular history	Fall	April 28, 1885	Absc
Case 71	Herbert Boden	5	June, 1884	None	Fall	Nov. 20, 1884	Absc
Case 72	Elizabeth Leonard	5	Jan., 1885	Measles and hooping cough	Fall	April 30, 1885	Absc
Case 73	William Jones	4	?	None	None	Oct. 30, 1884	Absc
Case 74	Henry Horridge (<i>Double hip disease</i>)	3	Right, Left, Nov. 3, 1884	None	None	Right, Oct. 10, 1884; Left, Jan. 29, 1885	R. Ab L. Ab
Case 75	Alfred Fitzgerald	4	Nov., 1883	None	Fall	Oct. 9, 1884	Absc
Case 76	Walter Bailey	6	Jan., 1884	Hooping cough two years ago	None	June 25 (?), 1885	No ext absc

State of acetabulum.	State of Femur.	Result and when last seen.
sequestrum ; perforated	Epiphysis pale; epiphysial cartilage loose and perforated; below this (in neck) bone soft and mottled; trochanteric epiphysis soft and injected	In hospital; doing well, May, 1885. July, 1885, wound healed; still much thickening. Oct., 1885, sinuses again appeared. July, 1886, has had scarlet fever, and there are now sinuses, and much swelling; is well in general condition. Dec., 1886, in hospital with sinuses; may require amputation.
sequestrum ; perforation	Cartilage ulcerated and eroded; bone mottled, extending below epiphysial line	March, 1885, has still a sinus, but is fat and well; in Thomas' splint. May, 1886, two sinuses; 2½ in. functional, 1½ in. actual shortening; mobility through 45 deg.; fat and well; good power, but cannot walk much.
several large sequestra. anæmic portion of pelvis loose on rest.	Epiphysis nearly half gone; cartilage loose	Doing well; still in hospital, May, 1885. February, 1886, still sinuses. Dec., 1886, all healed, walks very well; 1½ in. functional, 1 in. real shortening; almost full mobility.
Several sequestra	Cartilage in head thinned and loose; bone pale and mottled	Dec. 3, 1884, sent home with one small sinus, nearly healed.
it, healthy it, smooth	<i>Right</i> , head extensively diseased; cartilage entirely eroded, and bone pale and anæmic down to epiphysial line. <i>Left</i> , extensively diseased; bone soft and rarefied; cartilage almost entirely gone; disease reached below epiphysial line	<i>Right</i> healed; in double Thomas'; <i>left</i> a sinus; sent to sea side in May, 1885; general condition improving much. Aug., 1886, can stand alone and walk a little; <i>left</i> not quite healed. Oct., 1886, both healed; can stand, and is beginning to walk; fat and well. Nov., again a little discharge.
decayed.	Cartilage at upper part entirely eroded, at lower part eaten into; whole epiphysis diseased and epiphysial line perforated at one spot	May, 1885, doing well, but still a sinus; in Thomas' splint; general condition good. Sept. 29, 1885, healed; straight; mobility 50 deg.; well; shortening 1½ in. functional, 1 in. actual; a little pain in hip in morning; quite healed and sound; walks well.
high at one end only	A large sequestrum occupied the head and extended down to the line of section; a softish spot at one point in shaft below section	July 15th, 1885, wound superficial. Oct. 10, 1885, all healed; to leave off Thomas'; no pain; well. May, 1886, 1½ in. functional, and the same actual shortening; very little power; walks poorly; has two small residual abscesses. Oct., 1886, abscesses have discharged; otherwise well; has some pricking pain at night.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint: time of Operation.
Case 77	Susannah Wood	10	Jan., 1885	Hip disease in family	None	July 2, 1885	Abscess in front of joint
Case 78	Robert Carter	5	March, 1884	Spine disease in family	Fall	July 23, 1885	Abscess
Case 79	Thomas Frederick Day	9	Jan., 1885	None	None	July 23, 1885	None
Case 80	Frederick Walker	11	Dec., 1884	None	Injury	July 15, 1885	Abscess
Case 81	Abraham Collinge	5	Jan., 1884	None	Fall	June 18, 1885	None
Case 82	Elizabeth Butterworth	3	Jan., 1885	None	None	Oct. 8, 1885	Abscess
Case 83	Minnie Hoyle	7-6	Christmas, 1884	None	Fall	Oct. 24, 1885	Abscess
Case 84	Charles Isherwood	4	May, 1884	None	None	Oct. 23, 1885	None
Case 85	James Wharton	2	Jan., 1885	Scarlet fever; whooping cough	None	May 7, 1885	Abscess

State of Acetabulum.	State of Femur.	Result and when last seen.
Perforated; sequestrum	Cartilage loose and thinned; epiphysis pale and cheesy looking; below epiphysial line a cheesy patch; trochanter mottled in centre	Tube removed July 23rd; doing well. Heard of Oct. 23, 1885; one sinus; no pain; in Thomas' splint in good position; not much discharge; in bed. May, 14 in. functional, 3 in. actual shortening. July, 1886, almost healed; fat and well, only slight mobility; in good position; can walk a little. Dec., 1886, a fresh abscess.
Much roughened	Head of bone partly absorbed, rough, and almost bare; epiphysis quite cheesy; below epiphysial line mottled and rarefied	Still discharging, Aug. 24, 1885. June, 1886, a sinus and some thickening about hip; cannot walk, to wear Thomas' splint.
Slightly rough at one spot; head of bone lay dislocated above rim of acetabulum	Surface of neck where it rested against edge of acetabulum rough and eroded; head smooth; cartilage loose; bone soft and pale beneath	Wound superficial, Aug., 1885. Oct. 10, 1885, all healed; in Thomas'; fat and well; no pain. Oct., 1886, has had a sinus, but is now almost healed again. Dec., wound healed.
Smooth, partly granulation lined	A small sequestrum in the head of the bone, led to the joint through a little opening in the cartilage covering the head	Oct., 1885, doing well; two sinuses, very little discharge; gets about in Thomas' splint; no pain; straight; well. July, 1886, a sinus, otherwise quite well. Oct., 1886, as above; walks.
Rough, and cartilage loose	Cartilage almost entirely eroded; patches of cheesy bone extended through the epiphysial cartilage to the shaft; a zone of inflammation on each side of epiphysial cartilage	Wound superficial, Aug. 11, 1885.
Filled up with granulations	Head flattened and distorted; cartilage thin and discoloured; two sequestra in the head and neck and one in shaft	Dec. 17, in Thomas', wound healing rapidly. Oct., 1886, fat, sound, and well; good mobility. Nov., walks well, 1 in. shortening. Dec., has a small abscess.
Bare and irregular	Large sequestrum in neck; about 1/4 of head gone	Nov. 28th, wound healed. May, 1886, all healed; walks well; quite straight; good mobility every way.
Granulation lined; bare at one spot	Large, loose, soft sequestrum lying in front of the neck; about half the head gone; cartilage loose; section of head and neck mottled	April 20, 1886, nearly healed; no pain; cannot walk yet; has corneal ulcers.
Hollowed out	Cartilage gone; epiphysis eroded; cheesy mass in shaft (a sequestrum)	Died of measles and tuberculosis July 13, 1885.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint at time of Operation.
Case 86	Esther Mosey	7	.....	None	None	Jan. 1, 1886	Abscess not made out to communicate with joint
Case 87	Charles Fielden	8	Dec., 1884	None	None	Dec. 10, 1885	Abscess
Case 88	George Gleave	7	July, 1884	Measles	None	Jan. 28, 1886	Abscess
Case 89	Mary Bentfield	9	Jan., 1881	None	Fall	Feb. 11, 1886	Abscess
Case 90	Joseph Ridgway	4	Aug., 1884	None	None	March 4, 1886	Abscess
Case 91	Isaac Rubinstein	5	Christmas, 1884	None	None	Nov. 23, 1885	Abscess
Case 92	William Price	3	April, 1885	Tubercular history. Measles	None	April 14, 1886	Abscess
Case 93	Frank Stubbs	6	Aug., 1885	Tubercular history	Fall	April 6, 1886	Abscess
Case 94	Charles Horrocks	9	Dec., 1885	? Tubercular history	Fall. History unsatisfactory	April 1, 1886	Abscess

State of abulum.	State of Femur.	Result and when last seen.
Large thin loose; a us patch one bare	Head rough and bare; all cartilage gone; epiphysis pale and carious	Feb. 20, 1886, wound healed; gets up. July, 1886, all sound; good mobility; walks with very slight limp.
Large cavity ing up to or inferior containing sequestra	Cartilage thinned and in parts gone; bone pale and mottled above epiphy- sial line and a patch below	Feb. 22, 1886, superficial wound; sent home in Thomas'. Aug., 1886, in hos- pital with sinuses; not doing well. Oct., 1886, somewhat improved, but still sinuses.
Cartilage rough	A large cavity in the neck extending through the epiphysal line to head, another focus also in neck; cartilage rough and perforated (articular)	March 13th, healed to a small sinus. May, 1886, $\frac{1}{4}$ in. functional shortening, none real; straight; very little dis- charge. Oct., 1886, wound almost dry; walks well; good mobility. Dec., wounds healed, has a residual abscess.
High and carious	About $\frac{3}{4}$ of head gone; bone pale	March 17, 1886, wounds almost completely filled up. July, 1886, was healed, but has now sinuses again; has been running about without any care; in June there was $1\frac{1}{4}$ in. functional, 1 in. actual shortening; good power; mobility through 30° ; walked well.
High and us, many sequestra	About $\frac{1}{4}$ rd of epiphysis gone; a large patch of yellow (?) caseous bone; rest mottled, deep purple, and rarefied	May 12, almost healed. Dec., 1886, can walk a little; one sinus; in good condition, about 1 in. shortening; good mobility.
One at one rest granu- n covered	Head, neck, and nearly all epiphysal cartilage gone; a large sequestrum and several smaller ones	July, 1886, a fresh abscess over Poupart's ligament; other sinuses puckering in; general condition fair; still wears Thomas' splint, and is in good position. Dec., 1886, almost healed; no pain.
Ged and ated, two stra lying se in it, fency to ration of into com- ent bones	Head soft and destroyed, represented only by a cheesy sequestrum; caseous detritus in neck, extending down shaft to below line of section	May 31, 1886, doing well, but not able to get up.
Mulation ined	Sequestrum removed from neck, December 3, 1885. Not excised till later; the head rough and carious; no repair	June 3, almost filled up; sent home. July, 1886, healed to one sinus; not very strong; a little adduction; doing well; to have patten and crutches, and leave off Thomas' splint.
The rough l pitted	Dislocation on dorsum reduced Feb- ruary 11, 1886. At excision April 1, 1886; head bare, bone rarefied and mottled	Was only excised as a means of drainage; his condition was hopeless at the time, and he died on April 15th.

No. of Case.	Name.	Age.	Date of Onset.	Predisposing Cause.	Exciting Cause.	Date of Operation.	State of Joint at time of Operation.
Case 95	James Tunstall	10	Aug., 1885	None. Has anal fistula	Fall	Dec. 3, 1885	Abscess
Case 96	George Clayton	11	Jan., 1884	None	None	Feb. 11, 1886	Sinuses
Case 97	Elizabeth Elliott	6	Nov., 1885	Tubercular history	None	July 29, 1886	No abscess, but lymph in joint
Case 98	Sarah Jane Bond	9	July, 1885	Probably tubercular	Fall	Aug. 5, 1886	Abscess in joint; none external grating
Case 99	Eleanor Coupe	17	Jan., 1877	None	Fall	Jan. 21, 1884	Sinus; much shortening
Case 100	John Warburton	4½	Dec., 1885	None	Fall	July 8, 1886	Abscess

State of Acetabulum.	State of Femur.	Result and when last seen.
Bare at one spot	Cartilage thinned, bone pale, in spots rarefied and gelatinous	Unhealed ; more discharge ; not doing very well. Was amputated Aug. 27, 1886. Dec., 1886, still free discharge.
Perforated ; a sequestrum removed	Head, trochanter and upper end of shaft much diseased ; all cartilage gone	Dec., 1886, unhealed ; much thickening and sinuses ; general condition fair.
Granulation lined, but smooth	Two-thirds of epiphysis gone ; caseous patch and rarefying osteitis below epiphysial line, cartilage necrosed and loose	Doing very well. August 10, 1886. Aug. 30, almost healed.
Perforated, three sequestra removed	Epiphysis nearly all gone ; bone below carious and rarefied	Died of shock after 48 hours.
Fairly healthy, but some thickening felt per rectum	Head and neck almost entirely gone	Recovered slowly and with difficulty, but May, 1885, is in good condition, though still sinuses. A greatly shortened limb. Dec., 1886, slowly healing.
Smooth	Cartilage thin and loose ; epiphysis carious	Aug. 2, 1886, discharged, doing well. Oct., 1886, almost healed ; doing very well. Nov., is beginning to walk.

APPENDIX I.

CASES

[For Summary and latest results, *vide* Table, p. 136 *et seq.*]

EXCISION.

CASE I. *Abscess. Femoral Disease. Recovery.*—Alfred D., age $7\frac{1}{2}$ years. Admitted September 23rd, 1881. Phthisical family history; had a fall in Whit-week, 1881; lameness and night pain since; no treatment. On admission, right thigh flexed slightly, adducted and rotated inwards, fixed to pelvis and painful on movement; abscess above and behind the great trochanter. September 30th, the head of the femur was excised antiseptically. Throughout October had diarrhœa at times; the wound did well; in December he was gaining flesh and got up with crutches and a patten on the sound leg, extension being kept up while in bed; his progress varied somewhat; an incision had to be made at one time in front of the thigh, and he was discharged in a Bryant's splint in January, 1882. He was seen January, 1883, in good position, and the hip improving and promising well; very little discharge, swelling going down, and he was gaining flesh. February, 1884, $1\frac{1}{4}$ inch shortening; two sinuses; joint stiff; is anæmic, but growing fast. February, 1885, doing well (*vide Fig. 5*).

[NOTE.—“*Functional*” shortening is used to express measurement from anterior superior iliac spine to inner malleolus; “*actual*,” “*real*,” or “*femoral*” shortening is measured from the top of the femur on the excised side, and compared with measurement from the top of the trochanter major on the sound side.]

Case 2. *Abscess. Primary Femoral, probably Secondary Acetabular, Disease. Recovery.*—James Thos. E., age 4½ years. Admitted September 23rd, 1881. Was in the hospital April 19th—June 13th; discharged wearing plaster-of-Paris splint. Condition on admission: General condition good; left thigh, fixed; abscess; adduction. Treatment: September 30th, excision; antiseptic; acetabulum much diseased, scraped; half the femoral epiphysis was gone, and the bone below was diseased. Result: December 15th, still a sinus leading to carious acetabulum; gets up with patten on sound leg and crutches; fat and well. October, 1882, sinuses not yet closed, though nearly so; general condition good; limb somewhat flexed.

Case 3. *Femoral and Acetabular Disease. Necrosis. Death 4 years and 5 months after Operation.*—John Fredk. M., age 9 years. Admitted May 20th, 1881. Duration since early in 1879: Was in hospital in that year; right hip, swelling eight weeks ago. Condition on admission: Flexion, rotation in, much wasting; abscess; movement painful. Treatment: May 26th, excision; head of bone rough and bare of cartilage; acetabulum carious and necrosed; salicylic silk dressing. Result: December 15th, still a sinus, with some carious bone in acetabulum; is strong and well, and gets up. In October, 1885, he was dying of lardaceous disease, having been under treatment intermittently since the operation.

Case 4. *Abscess. Double Hip Disease. Recovery.*—Emily Jackson H., age 5 years. Admitted April 20th, 1881; discharged November, 1881. Duration, etc.: Always delicate; fall twelve months ago, limped afterwards; has not walked without help for six months; in bed five months. Condition on admission: Double hip disease, left most advanced; left gluteal fold deeply marked, right almost obliterated; pelvis tilted up on left side; left trochanter thickened; pain on movement in both hips, in the right only in extreme degrees. Treatment: Extension to both legs; Bryant's splint. August 12th, left hip excised, infra-trochanteric section; head carious and pus in joint; a cavity in the

neck; antiseptic; did well; right hip slowly subsided. Result: Gets about with a patten on the right leg and crutches; still sinus in left, but does not pass down to bone. Seen a few weeks after discharge, the right hip was showing signs of relapse. In March, 1883, she was doing well (*Fig. 11*).

Case 5. *Abscess. Femoral Disease. Anterior Incision. Recovery.*—Fanny A., age $4\frac{1}{2}$ years. Admitted October 5th, 1881; discharged November 27th. Family history good. Duration eighteen months. For five and a half months has had extension; swelling appeared September 30th; was well till she had measles. Condition on admission: Left hip swollen; abscess; lordosis and adduction; stiffness at end of flexion or extension only. Treatment, etc.: October 13th, excision under spray; acetabular cartilage gone, but no bone bare; the upper femoral epiphysis was all gone, and there was a cavity in the neck; incision in front of trochanter did not seem to have any advantage; salicylic silk dressing; 18th, foetid; November 7th, tube taken out; November 21st, up on a patten and crutches; wound not healed. Result: In good condition; wound not healed. February, 1885, heard of as doing well.

Case 6. *Femoral Disease. Incision. Septicæmia. Excision. Death.*—Hannah H., age $9\frac{3}{4}$ years. Admitted June 24th, 1881; died August 24th, 1881. Family history good. Duration of disease: About eight months ago began to limp; pain at night; has not walked for a month. Condition on admission: Left thigh semi-flexed; a little inverted; fixed, tender, and painful; well-nourished girl. Treatment, etc.: Extension and a long splint to the other leg. Later, July 28th, fulness appeared in groin; veins prominent; cannot flex thigh without much pain; much thickening. July 29th, joint opened in front, turbid serum and flakes of lymph let out; cartilage pitted and separable from both head and acetabulum, the latter bare in one spot. A counter opening was made behind and a tube passed through. Convulsions resulted, with collapse, vomiting, and later high temperature. The wound became septic on August 5th and

was irrigated. On 18th, excision of head of bone through anterior opening. Cartilage nearly gone. Result: Sank and died on 24th.

Case 7. *Femoral Disease. Anterior Incision. Recovery.* Emma T., age 8 years and 8 months. Admitted July 22nd, 1881; discharged November 11th, 1881. Family history good. Duration of disease, etc.: Two and a half years ago was an out-patient for ten months. Treatment: Extension for five months; was better for eighteen months, only limping when tired; pain in knee eleven weeks ago. Condition on admission: General condition good; right limb fixed, movement painful; no shortening; some outward rotation; fulness in front of joint. Treatment, etc.: Extension; August 8th, deep fluctuation was felt; August 11th, excision by incision made at front of joint; the cartilage found peeling off, and the joint full of pus; the epiphysis was inflamed and the cartilage necrosed; a counter opening was made behind and a drainage tube put in; operation antiseptic; October 11th, became septic; pressure applied with a Martin's bandage; November 7th, gets about with patten on sound leg and crutches. Result: December, 1881, wounds still open; general condition good; some adduction; some mobility; fairly satisfactory so far; October, 1886, general condition good, but still a sinus; can walk (*Fig. 4*).

Case 8. *Latent Disease. Malposition. Osteotomy. Excision.*—Albert E. D., age 8 years. Admitted July 8th, 1881. Duration of disease, six years; three years ago had an abscess opened, which healed twelve months ago; has been worse lately and had more pain. On admission, fairly healthy boy; left leg shortened and wasted; thigh greatly flexed, fixed, and rotated inwards; great trochanter raised and prominent; some tenderness over it, and the scar of a sinus below it; also a second scar lower down on the thigh. The flexion was so great as to make the limb nearly useless. July 29th, infra-trochanteric osteotomy with MacEwen's osteotome was performed, and the limb brought down, though not perfectly straight; extension by weight was

applied. August 14th, wound healed; August 23rd, the old sinus below the joint has reopened. September 2nd, as the sinus was found to communicate with an abscess cavity in the buttock a counter opening was made, and a second on October 27th. November 7th, tenderness and swelling appeared in the groin, the T. rose, and the boy looked worse. November 11th, the upper end of the femur was excised, some diseased bone removed from the acetabulum; the head of the bone was nearly gone and its remains pale and sclerosed; the acetabulum was found to be perforated. He went on very slowly, and was discharged in January, 1882, with the sinuses unhealed but the disease quiescent. In February, 1883, he was seen; there was not much swelling and he was in good position, but there were still sinuses, and he was pale and anæmic. In this case the pelvic disease prevented the possibility of recovery without excision, although there was little evidence of it at the time osteotomy was done. May, 1885, still a sinus.

Case 9. *Abscess. Femoral Epiphysis nearly separated. Recovery with Sinuses.*—Julia C., age $1\frac{3}{4}$ years. Admitted September 27th, 1881; discharged November 20th, 1881. Duration: Was in Children's Hospital early in 1881. History deficient. Condition on admission: Abscess. Treatment: September 30th, excision; epiphysis caseous and nearly separated. Result: Discharge slight; wound healthy; does not gain ground. March, 1883, fat and well, but still sinuses.

Case 10. *Abscess. Femoral and Acetabular Necrosis. Stiff Joint.*—Elizth. Ann O'N., age 5 years 2 months. Admitted June 22nd, 1881. When fifteen months old fell from her cradle; twelve months after hip disease appeared; six months ago abscesses. On admission, delicate child; right hip acutely flexed, very tender, trochanter thickened, abscess and sinus, much wasting and adduction. 30th, upper end of femur excised after previous exploration; acetabulum perforated and sequestrum lying in it. Head and neck of femur represented by a small necrosed button of bone: not antiseptic. July 22nd, some more bone

removed from both femur and acetabulum; general condition improved. October 1st, still bare bone to be felt; was not so well in October and the early part of November, with more pain and discharge. In January, 1882, she was discharged somewhat improved; seen at out-patients' at the latter part of June, 1882, all the wounds, except the excision one, were healed, two small sequestra were loose in the mouth of the sinus; the general condition was good; there was $\frac{3}{4}$ inch shortening, and the position was good, except that there was slight adduction; there was apparently rather firm ankylosis of the joint.

Case 11. *Femoral Disease. Incision. Pyæmia. Excision. Death.*—Joseph P. H., age $4\frac{1}{2}$ years. Admitted April 4th, 1881; died May 15th, 1881. Family history: Phthisis. Duration of disease: Quite well till six weeks ago, when he was injured; extension soon applied; had much pain and fever; knee tender. Condition on admission: Anæmic; wasted. Right thigh and leg flexed; lies towards right side; no other marked local signs; is cross and irritable. Treatment, etc.: Extension on 9th; some thickening about trochanter. April 12th, joint incised; did badly; wound became septic; temperature high. April 30th, excision; femoral cartilage gone; no acetabular disease. Result: Died of pyæmia; abscesses in lungs and kidneys; ilium extensively necrosed and pus in the pelvis (*Fig. 31*).

Case 12. *Femoral Necrosis, Acute. Acetabular Disease. Recovery.*—Mary Martha B., age 7 years. Admitted September 1st, 1881; discharged December 7th, 1881. Duration: Fall three weeks ago; four days later pain. Condition on admission: Lies on right side with knees flexed and left thigh adducted; tenderness all round left trochanter, and swelling on inner side of thigh; no grating; thigh not fixed. Treatment, etc.: Extension. September 12th, abscess opened on inner side of thigh; grating felt. September 30th, excision, and gouging of acetabulum, which was extensively diseased; the epiphysis of the head lay loose in the acetabulum at its posterior part (it, *i.e.*, acetabulum, was enlarged); eucalyptus spray. October 7th, wound

septic. 18th, abscesses; counter openings made. 29th, pus in motions; steadily got better. Result: Discharged soundly healed; good mobility; can stand on excised limb; shortening $1\frac{1}{2}$ in.; good position; general health good. March, 1885, sound and well; walks (*Figs. 18, 48, and 49*).

Case 13. *Femoral Necrosis. Recovery.*—Ellen O'G., age $10\frac{1}{4}$ years. Admitted October 8th, 1880; discharged April 19th, 1881. Duration: When nine years old had apparently acute periostitis in left leg; one month ago right hip swelled; no injury. Condition on admission: "Strumous;" anæmic; great swelling of right thigh, groin, and buttock; $\frac{3}{4}$ in. shortening; usual position; great venous congestion; necrosis of left tibia; fluctuation round hip. October 24th, grating in joint. November 1st, excision; head of bone lying loose in abscess cavity; operation antiseptic. Result: October 11th, 1881, hip healed, except one superficial spot; 3 inches shortening; free mobility in all directions; can walk. July, 1885, right hip, two sinuses; has an abscess about left hip, but general condition is excellent (*vide Table Fig. 17*).

Case 14. *Sinus. Advanced Femoral Disease.*—Thos. M., age 4 years 1 month. Admitted October 5th, 1881. Had a fall two years ago; nineteen months ago walked lame; abscess burst ten days ago; had been under previous treatment by weight. On admission, considerable flexion, wasting of limb, thickening of great trochanter, rigidity with pain on movement, especially adduction; a sinus in buttock. Up to October 13th had pain and night screaming; excision of upper end of femur, through trochanter; head of bone was almost gone, and soft and carious as far as the neck, in which was a sequestrum; acetabulum diseased; not antiseptic; progress of case was variable, but on the whole fairly good up till January, 1882, when he was discharged. Throughout 1882 he did well; in February, 1883, he was seen, and was in fair condition with good mobility, and able to get about, though the sinuses were not entirely closed. October, 1885, fat and well; one superficial sore (*Fig. 24*).

Case 15. *Sinuses. Femoral Disease.*—Alice M., age 5 years 11 months. Admitted November 16th, 1881. A fall eighteen months ago; two months after began to limp; several months ago abscesses appeared. On admission, well nourished; slight flexion; half an inch shortening; outward rotation; no adduction; sinuses; apparently complete rigidity, except that attempted movement causes pain. November 25th, the upper end of the femur was excised, the sinuses washed out with chloride of zinc and scraped, and antiseptic dressings used; the upper epiphysis was entirely gone, and the bone below was pale on section with a hyperæmic patch in it; a sharp spur of bone, the "calcar femoris," projected from the anterior and inner aspect of the stump of the neck; the acetabulum was covered with granulations. On 29th wound was septic; she did not do very well, and there was considerable thickening about the upper part of the thigh, but on her discharge, in February, 1882, she was in good health, with no pain, and there was considerable mobility and considerable power in the limb. In April, 1882, she was still improving. Heard of in 1883 doing well. 1885, healed.

Case 16. *Sinuses. Femoral and Acetabular Disease. Necrosis.*—Elizth. D., age 11 years 2 months. Admitted November 16th, 1881. Lameness first appeared seven years ago; no injury; family history good; has had treatment irregularly; in September, 1881, an abscess first appeared and soon discharged. On admission, somewhat pale but well nourished; considerable flexion; some adduction of left leg; an abscess in gluteal region; trochanter a good deal thickened; muscles wasted; movements of joint painful and restricted; 2 inches actual shortening; a sinus in front of tensor vaginæ femoris; had night crying and high temperature. On November 24th under chloroform, grating was felt in hip, which was excised through the trochanter in the usual way; the epiphysial cartilage was destroyed and the remains of the neck and upper part of the shaft caseous; a number of small sequestra were found in the acetabulum; wound washed out with chloride of zinc and dressed anti-

septica; had much vomiting and carboluria, but no albuminuria after the operation; was discharged January 21st, 1882, getting about with a crutch and unhealed sinus. Since then, up till February, 1883, she has remained much the same; the sinuses have not healed, and at times fresh suppuration has appeared, but she has not lost ground; the limb, however, has not gained strength, and its ultimate usefulness is very doubtful. October, 1886, slowly healing, but limb useless as yet.

Case 17. *Disease of Hip and Knee. Incision. Subsequent Excision. Fracture of Femur. Death.*—William J., age 5 years. Admitted January 24th, 1881; discharged July 9th, 1881. Duration of disease: Pain in hip in spring of 1880. Left the hospital seven months ago with stiff apparatus on. This was removed a month ago. Pain since. Condition on admission: Left thigh swollen, especially in groin; leg rotated out; very tender; pulpy disease of same knee; pelvis tilted towards diseased side; thickening of trochanter; no grating. Treatment, etc.: Swelling in groin increasing; extension applied; pain less; has bronchitis; is drowsy. February 19th, capsule incised; some thickened caseous matter escaped; grating in joint; bone bare and rough; pus contained some very large oval granular cells; temperature rose and remained high; still listless. March 7th, urine alkaline and offensive. Boy has fouled his dressings. March 7th, wound offensive, washed out with zinc chloride. March 10th, excision; in protruding the head of the femur the shaft fractured in the middle; the head was carious, little cartilage being left; some small bits of carious bone removed. Wound treated with zinc chloride, gr. 40—1 oz., and antiseptic dressings. March 11th, wound foetid. Urine became albuminous in May, the discharge was foetid; no firm union of the fracture; had persistent diarrhoea. July 2nd, counter opening made; diarrhoea continued; bronchitis reappeared, and he gradually sank. Result: Died July 10th.—P.M.: Pneumonia at right base, one tubercle found; congestion at left base and pleurisy; liver large and pale, not lardaceous; no other organs

lardaceous either; upper end of femur necrosed; no union, but some callus at fracture; pelvis much necrosed; pus in iliac fossa.

Case 18. *Femoral and Acetabular Disease. Excision. Amputation. Recovery.*—John M., age 11 years. Admitted October 7th, 1880. Condition on admission: October 7th, 1880, left hip $1\frac{1}{2}$ in. shortening; large abscess over upper part of femur; very anæmic. Treatment, etc.: Abscess opened; joint found disorganised. October 30th, excision; bone soft and breaking down; no head left; acetabulum perforated; he became very low and feeble, and in November passed blood in his urine for two days. December 20th, some dead bone removed; whole thigh riddled with cavities and flail-like, disease spreading down inner side of femur, and some osteomyelitis. April 11th, amputation at hip by oval method; femoral artery twisted. Result: December, 1881, in good health; still some sinuses discharging, but fewer and less discharge; is steadily improving, and gets about well with a crutch. March, 1883, not healed, but doing well; gets about. He subsequently got fat and strong; wounds nearly healed, January, 1884 (*Fig. 52*).

Case 19. *Sinus. Femoral and Acetabular Disease. Death.* John Jas. K., age $11\frac{1}{2}$ years. Admitted November 28th, 1881. Duration of disease two and a half years; an abscess opened two years ago; could walk for a year afterwards, though with a limp; got worse in February, 1881, and has been in bed since. On admission, pale, but not ill nourished; right thigh flexed, fixed, and adducted, a sinus over the outer side of limb 6 inches below joint; had extension applied with weight till December 9th, when being examined under an anæsthetic grating was felt in the joint; the head and part of trochanter were excised; the acetabulum was diseased and the bone unusually soft; operation not antiseptic; had some starting at night after operation; had extension on at first; a month later was put in a Bryant's splint; position improved. On February 14th, 1882, a Thomas was applied, and he was discharged; he

has since been at home and has steadily declined; amputation was advised, but the friends refused. Died March, 1883.

Case 20. *No External Abscess. Femoral Disease.*—Annie W., age 4 years 8 months. Admitted November 22nd, 1881. Family history good; no known cause for disease, which first appeared in May, 1881, with tenderness of hip and lameness; was under treatment irregularly till admission; constant pain at night; this apparently preceded the lameness. On admission, fairly well nourished; limb adducted and rotated slightly outwards; slight fulness in front of joint, but no definite abscess; thigh fixed to pelvis; attempted movement painful; treatment, extension by weight and blister; until December 15th had frequent night screaming. December 15th, excision of head and part of trochanter; the upper epiphysis was half absorbed, and the remains were caseous on both sides of the epiphysial line; acetabulum rough; operation antiseptic; progressed slowly; a good deal of swelling; was put in a Thomas on February 14th, and discharged with unhealed sinuses on the 19th, to get about with a Thomas and crutch (*Fig. 3*).

Case 21. *Caries Sicca. Died 9 Months after Operation.*—Harriet Ellen A., age 9 $\frac{3}{4}$ years. Admitted October 29th, 1880; discharged April 6th, 1881. Family history: Father died of phthisis. Duration of disease: Two years ago had several falls and limped afterwards; well fed; has been on crutches for last six months. Condition on admission: Limb in extreme *abduction* and *rotation outwards*; much thickening; no fluctuation; tendency to dislocation backwards and downwards; muscular wasting; much lateral curvature of spine and lordosis. Treatment: Straightened under chloroform and long splint applied; grating in joint; did not get on well; much thickening; high temperature and pain; abduction not remedied. January 15th, 1881, excision; subchondral caries; ligamentum teres gone; no pus; acetabulum rough, scraped a few bits of bone away; antiseptic; infra-trochanteric section. Result: Did fairly well for a time, but died with pelvic mischief about July, 1881.

Case 22. *Abscess. Extension of Disease after Operation. Ultimate result doubtful.*—Ernest J., age 7 years. Admitted March 8th, 1881; discharged October 28th, 1881. Duration five years; been in the hospital twice; disease came on after a fall; he was sent out in a splint with a patten on sound leg in August, 1880. Condition on admission: Abscess; no pain. Treatment: Extension. April 2nd, excision; acetabulum rough, was gouged; head of femur carious; operation antiseptic. 22nd, septic. June 16th, 2 in. of diseased femur removed. Result: Did badly; diarrhœa; not in condition for amputation; heard of in Salford Workhouse, and was alive and improving up to October 1882.

Case 23. *Abscess. No good Result.*—John Albert D., age 9 years. Admitted January 20th, 1881; discharged May 2nd, 1881. Duration: Three months ago fell; has not walked well since. A few weeks ago complained of pain in hip and later in knee. Condition on admission: Anæmic; pain in left hip, especially at night; fulness about hip; $\frac{1}{2}$ in. shortening; great pain on movement; leg somewhat flexed and *rotated out, he lies towards affected side*; right leg and foot rotated in; pelvis raised on sound side, he lies on flattened buttock of diseased side; phimosis. Treatment: Long splint to sound side and extension by weight. Circumcised February 21st. March 25th, hip excised; head carious; much pus. Result: Did not do well; wounds sluggish; tubercular meningitis seemed to threaten; taken home by friends with wound unhealed. December, 1881, feeble and anæmic; free discharge still from sinus; much thickening about femur; some adduction; has left off weight; 2 in. shortening; to renew weight. Lost sight of.

Case 24. *Sinus. Femoral Disease. Relapse.*—Alice P., age $5\frac{1}{2}$ years. Admitted October 22nd, 1880; discharged February 7th, 1881. Duration: Twelve months ago was in hospital for hip disease and left in starch bandage; been no abscess; has got about with crutches since. Three months ago had swelling, which broke. Condition on admission: Pale; left hip, rigid, flexed, pain in joint, swelling

and tenderness, no grating or fluctuation ; a sinus over trochanter. Treatment : November 20th, hip excised ; head had disappeared ; a small bare spot in acetabulum ; scraped ; operation antiseptic ; sinus scraped out. Result : February 7th, 1881, hip soundly healed ; in good position ; $2\frac{1}{2}$ in. shortening ; fairly movable. November 4th, 1881, limb in good position ; $1\frac{1}{2}$ in. shortening ; good power and mobility ; has been getting about with one crutch and no high shoe ; there has been a little discharge from the sinus and some pain at night from over exertion going to school. December 2nd, 1881, discharging spot apparently superficial ; otherwise well. February, 1882, the hip, which had been soundly healed, has again broken down.

Case 25. *Sinuses. Abscess. Extensive Necrosis. Amputation. Recovery.*—Sarah Jane N., age $10\frac{1}{4}$ years. Admitted October 8th, 1880 ; discharged April 19th, 1881. Family history, phthisis. Duration of disease : Seven years ago was in Children's Hospital for hip disease ; has since got about with a crutch ; free from pain till one month ago, when she was kicked. Condition on admission : Much adduction of thigh, much swelling ; two sinuses ; no albuminuria ; "strumous" child. Treatment : Large abscess opened behind trochanter ; loose fragments of bone removed. November 1st, had not done well ; excision ; head and neck entirely gone ; acetabulum perforated ; not antiseptic. November 19th, had hæmaturia for a fortnight. December 12th, sequestrum removed from acetabulum. January 22nd, losing ground ; upper end of femur carious ; sawn off ; no albuminuria. January 29th, amputation by oval method ; femoral artery twisted ; a good deal of collapse. Result : December, 1881, wounds not healed ; condition fairly good. 1885, still sinuses.

Case 26. *Abscess. Epiphysis Loose. Acetabulum Perforated.*—Wm. J. C., age 4 years 7 months. Admitted Oct. 20th, 1881. Family history tuberculous ; lameness began twelve months ago ; has been under treatment for short periods several times at one hospital or another ; worse lately ; an abscess noticed a few days ago. On admission,

left hip diseased ; flexion, adduction, fixation ; large superficial abscess ; no pain. October 21st, excision of head and part of trochanter ; six ounces of pus escaped ; the epiphysis of the head lay loose, and the acetabulum was perforated by a large opening with jagged rough edges, through which a finger in the rectum could very easily be felt ; operation antiseptic ; a few days later the discharge became foul, apparently from the contiguity of the rectum ; was treated at first by extension with weight ; subsequently a Bryant's splint was applied, and in the middle of December a Thomas' splint. Up to this time he very slowly but still decidedly improved ; subsequently counter openings were required, but no improvement took place, and he was discharged unrelieved in June, 1882.

Case 27. *Femoral Disease. No External Abscess.*—Thomas C., age 5 years. Admitted August 17th, 1881. Injury two years ago ; again twelve months ago ; disease progressing ; limb flexed, fixed, rotated out ; pain on movement, slight redness and venous turgidity over front of joint ; treated by extension and a blister. October 1st, has had frequent night pain. 6th, hip very tender, much pain if moved ; excision ; cartilage peeling off ; acetabulum lined with granulations ; a layer of lymph lying in joint ; epiphysis of head and femur partly absorbed and sclerosed ; all pain relieved by operation, which was antiseptic ; extension applied ; progress very slow. January 4th, 1882, was allowed up by day and had a Bryant's splint on at night. On February 21st he was discharged in a Thomas, slightly improved. In February, 1883, he was seen in a workhouse infirmary. He had been allowed to get into bad position, and had no extension or appliances, and there were numerous sinuses discharging freely.

Case 28. *Abscess. Extensive Femoral Disease. Sequestra. Amputation. Death.*—Thomas B., age 7 years 4 months. Admitted August 13th, 1882. Duration of disease four years ; pain in knee till last month, when he first had pain in hip ; had scarlet fever in March, 1882, after which the hip suppurated ; lost flesh subsequently ; was treated at home,

but operation refused. On admission, a pale, emaciated boy; much brawny swelling all round right hip, with a large deep abscess occupying gluteal region and sinuses; position fairly good; movements much restricted. August 17th, under ether, excision of upper end of femur; infra-trochanteric; epiphysis caseous, with caseous patches below epiphysial line, the greater part of the head being gone; acetabular cartilage covered with granulations and one or two spicula of loose bone; wound washed out with chloride of zinc; not antiseptic; a large abscess opened. Up to September 15th much discharge. October 5th, developed erysipelas, which extended over the whole limb; this subsided, but the condition of the limb was very unsatisfactory, flabby, powerless, oedematous, and not showing any signs of repair. November 2nd, operation; the external iliac was tied by a vertical incision over its course and the limb removed; subsequently the whole of the ischium up to the great sciatic notch and the pubes except the symphysis, together with almost all the ilium, which were necrosed or carious, were removed subperiosteally, the tissues readily stripping off and leaving a firm membranous wall to the pelvis; a good deal of oozing from the parts took place, and the boy died shortly after the operation.—P.M.: Viscera anæmic and fatty; no other change. The condition of the pelvis was one quite beyond repair, and it was determined to attempt the removal of all the bone which was past recovery, and, if necessary, the whole innominate bone on that side. A portion was left, though it was found that the whole bone could readily have been taken away if necessary, and the operation was thought to be quite worthy of adoption in suitable cases, probably a preliminary ligature of the common iliac would be wise, or possibly the use of Davy's lever might be sufficient.

Case 29. *Abscess. Acetabulum Perforated.*—Edwin H., age 6½ years. Admitted December 14th, 1881. Six months ago had pain; is supposed to have had an injury; family history good. On admission, fairly well nourished; rickety; right thigh flexed, adducted, and

rotated inwards; pain on movement; an abscess near the great trochanter; little tenderness; extension by weight. January 5th, the abscess was opened and found to be very extensive; discharge became foul on January 10th. February 2nd, discharge has been abundant since abscess was opened; the upper end of the femur was excised and the acetabulum gouged; subsequently the discharge lessened. On the 21st it was noticed that coughing caused welling of pus from the wound, due apparently to perforation of the acetabulum; he slowly but steadily improved, and was sent out in a Bryant's splint in August, 1882. Seen in February, 1883; the hip is in fairly good condition, but has a sinus still open; the boy was almost suddenly attacked with general anasarca about fourteen days ago, which is subsiding; he is probably lardaceous, liver and spleen both being somewhat enlarged.

Case 30. *Abscess. Disease of Shaft and Trochanter. Death after 1½ Years.*—Martha A., age 7 years 7 months. Admitted January 27th; readmitted May 2nd, 1883. Family history good. Previous history good till thirteen months ago; a fall; no pain for fourteen days, then limped; pain over left great trochanter. Treatment off and on. In bed since fortnight before Christmas. Night crying; losing flesh. On admission, rigidity; flexion; considerable thickening of trochanter; tenderness; no shortening; whole surface of great trochanter tender. Treated with extension till February 10th, then easy. Thomas' splint applied, and sent out. Readmitted May 2nd. Hip swollen; pain for sixteen days; had extension in bed lately. On admission, hip more swollen than in February; tender; abscess running up beneath Poupart's ligament. May 11th: Excision through trochanter major; head mostly gone; caseous bone extends to epiphysial line, and also to trochanteric epiphysis; another yellow patch below epiphysial line; bone around hyperæmic; two or three ounces of curdy pus escaped; antiseptic; in Bryant's splint; temperature 103.6° on third night; normal on 16th. July 26th: Antiseptics left off;

probe enters $1\frac{1}{2}$ inch; no bare bone; put up in Thomas' splint; $\frac{1}{4}$ inch shortening; some thickening in upper part of thigh in August, when she was discharged to go to seaside. Readmitted from seaside November 29th; a good deal of swelling about pelvis; sinuses unhealed; some pain; was put in Bryant; and by December 16th had got into a very satisfactory condition, and was sent out with a Thomas' splint on. Died exhausted March, 1885.

Case 31. *Early Femoral Disease. Recovery.*—Edward F., age 6 years. Admitted March 24th, 1885. No tubercular history. A healthy child; six months ago without known cause had pain in the hip and knee, and walked lame, but has been about till eight weeks ago; has cried at night. On admission, is thin and wasted; the left leg is slightly rotated outwards; there is no real shortening; a good deal of trochanteric thickening; fluctuation (?) can be felt in front of the joint; movements are very painful; extension applied. May 7th, excision; one or two vessels bled. Acetabulum healthy; the femoral cartilage was thinned, and beneath it was congested bone; below this the upper half of the epiphysis was pale; bone below healthy. All went on well, and the wound was reduced to a small superficial sore by June 2nd. When taken out of the Bryant's splint there was no shortening. Sent out in a Thomas' splint. Highest T. 99.4. June 30th, soundly healed; still wearing splint; to walk with patten and crutches; no pain. October 20th, 1885, mobility through 60° ; $\frac{3}{4}$ inch functional; no actual shortening; can stand on the leg; limb straight. December 15th, 1885, good mobility. January 9th, 1886, all sound and well; walks for ten minutes night and morning. This case shows the result of early excision, a much shorter convalescence than usual.

Case 32. *Sinus. Necrosis. Trochanteric Disease.*—Thomas B., age 9 years 5 months. Admitted October, 1882; readmitted July 11th, 1883. Family history: One cousin has had hip disease; otherwise good. History: Healthy till June, 1882, when he fell on a cricket ball, next

day he limped, and was in bed for five weeks ; his hip swelled and was incised, pus escaping ; been in bed off and on since. On admission, scar on outer side of front of thigh ; much swelling round hip ; top of trochanter raised 1 inch ; long prepuce ; sent out in Thomas' splint January 10th, 1883. Readmitted July 11th ; night starting and much pain last fortnight ; a swelling seen at out-patient department a month ago ; has gone about in Thomas' splint, with crutches, since discharge in January ; much swelling ; $1\frac{1}{2}$ inch shortening ; eversion ; trochanter thickened ; sinus discharging above Poupart's ligament ; old sinus healed ; general condition good ; periostitis of lower end of right fibula. July 19th, excision ; head almost entirely gone ; a small sequestrum ; acetabulum bare and a cavity in it ; a small spot of disease in trochanteric epiphysis, also in shaft ; epiphysial cartilage nearly gone ; not antiseptic ; temperature ranged 101—102 for first ten days ; not high afterwards ; did well ; up on August 13th in Thomas' splint ; much thickening still ; bare bone to be felt through pectineal sinus ; did exceedingly well ; and now, January 15th, 1884, is well ; $1\frac{1}{2}$ inch shortening ; a little outward rotation ; fat and well ; no pain ; mobility through 45° . June, 1886, fat and well, except one weeping spot ; walks well (*Fig. 30*).

Case 33. *Abscess. Femoral Disease.*—Mary H., age 4 years 11 months. Admitted October 25th, 1882. Family history not bearing on case. Was well till two and a half years ago, when she had diarrhoea, after this she began to limp ; has not walked for twelve months ; has had pain in left knee and hip for more than twelve months ; night screaming for several months ; extension by weight for twelve months ; abscess two months ; was in Children's Hospital, Pendlebury, in November, 1881, then had flexion, adduction, wasting, thickened trochanter, etc. ; no abscess. On admission, no shortening ; free and painless movement of hip in all directions ; pelvis tilted somewhat, but can be straightened ; walks on toes, but can put foot flat to the ground ; large abscess at upper and

outer part of thigh ; grating in joint. November 23rd, excision of hip ; much unhealthy pus ; section through the middle of the great trochanter ; the head of the femur was caseous and much grumous material in joint ; acetabulum fairly healthy ; antiseptic (Lister). December 20th, tube removed ; very little discharge. January 15th, antiseptics left off ; temperature normal throughout ; got up and about at end of January. July, 1883, sound and well with good mobility. October 10th, 1883, sound and well and full mobility as far as a right angle ; $1\frac{1}{4}$ inch shortening due to pushing up of the end of the femur, not to arrest of growth ; no pain. May, 1885, $1\frac{3}{4}$ in. functional, $\frac{3}{4}$ in. actual shortening ; quite well.

Case 34. *Abscess. Gouging. Excision. Primary Femoral and some Acetabular Disease.*—Wm. R., age 10 years 6 months. Admitted April 2nd, 1882. History: Pain in knee and night crying since 3 years old ; was in Great Ormond-street off and on till about 6 years old ; afterwards in Birmingham ; got about with crutches and stick till Christmas, 1881, when leg suddenly became shorter and more painful ;* was in Children's Hospital, Pendlebury, in February and March, 1882, and was relieved for a time. On admission, abscess in front of thigh. April 3rd, aspirated and Thomas' splint applied ; again aspirated on 20th, and again on two other occasions ; great trochanteric thickening. July 6th, trochanter, neck and head gouged, the abscess was emptied through the orifice, and a small wire tube passed in. Abscess in thigh opened July 10th. July 26th, bare bone at bottom of channel through trochanter. August 10th, hip excised ; head largely destroyed ; acetabulum diseased and some bone removed from it ; in Bryant's splint. January 20th, 1883, got up, doing well but slowly, and progress variable ; sinuses discharging. March 27th, antiseptics left off ; sent to seaside ; tempera-

* This might have been attributed to dislocation, but no such condition existed, and it probably merely indicated the well-known sudden bursting of the joint-capsule which occasionally occurs, usually accompanied by sudden adduction after previous abduction.

ture high throughout. He subsequently did exceedingly well, and in January, 1884, was quite strong and well, with a good sound limb, almost perfectly healed; $\frac{3}{4}$ inch to 1 inch shortening. February, 1886, sound and well; $2\frac{3}{4}$ inch functional, $2\frac{1}{4}$ inch actual shortening.

Case 35. *Abscess. Tuberculosis of Elbow, etc.*—Jas. Ed. C., age 7 years 1 month; admitted December 27th, 1882; family and previous history good; duration nineteen months; limping, and pain under knee; extension four months, then Thomas' splint; abscess fourteen days before admission; pain worse lately. On admission, in good condition; left leg $\frac{1}{2}$ inch shortening; large abscess outer side; trochanter thick; grating, no tenderness; long prepuce. January 11th, 1883, excision; curdy pus in abscess; antiseptic; extension; temperature irregular at first, 99—101; required frequent dressings; much discharge; pain at times, always in popliteal space. March 8th, wound healed up to one sinus. April 16th, antiseptics left off. Sent out on May 5th with still a deep sinus and an enlarged gland in groin; in Thomas' splint. February 12th, 1884, hip in very good condition, almost without discharge, but he has developed pulpy disease of the left elbow and sacro-iliac joint, and his general health is poor (*vide* Table).

Case 36. *Abscess. Femoral and Pelvic Disease. Erysipelas.*—Wm. M., age 8 years. Admitted June 16th, 1883. Family history of phthisis. Previous history: Good till two years ago, when an abscess formed in right shoulder, which was opened and healed up, afterwards breaking out again; about same time the left hip became bad; been out-patient for twelve months, part of the time with crutches, and part with extension; going down hill lately. On admission, $\frac{1}{2}$ inch actual lengthening; straight; large abscess; pain on movement; is easier lying prone; prepuce long and adherent. June 21st, abscess incised; 15 ounces of pus; some sanious oozing for some weeks; became septic early in July, but boy's condition had improved, though temperature hectic. July 12th, abscesses

laid freely open. July 23rd, still hectic; excision; half of head gone; all carious; healthy below epiphysis; acetabulum largely perforated and sequestrum in it; not antiseptic. August 6th, general condition much improved; a good deal of thickening of thigh lasted for a long time. In September had erysipelas, and incisions were made; he then rapidly improved, and on October 2nd was up with crutches and a patten on the sound limb; temperature still somewhat hectic; wounds discharging but fairly healthy; general condition good. January 15th, 1884, fat and well; but little discharge; sinuses puckering in satisfactorily; two of the five were healed; there is less swelling and no pain. October, 1885, unhealed; gets about with crutches (*Fig. 6*).

Case 37. *Abscess. Two Foci of Disease in Femur. Sequestra.* John R., age 4 years 1 month. Admitted April 3rd, 1883. Family history good. Previous history good. Seven months ago was lost for 14 or 15 hours, has ailed ever since, and five or six days after limped; had extension two months before admission, but was neglected at home. On admission, limb fixed, everted, $\frac{1}{2}$ inch shortening; trochanter much thickened; tenderness over hip; long prepuce; extension applied and long splint on sound leg. April 16th, no pain. May 19th, excision; quantity of pus and débris in joint; section through trochanter; a sequestrum lay in a cavity the size of a cherry in the femur below the line of section and a similar one was found in the head of the bone; put up in Bryant's splint; antiseptic; did well. June 13th, antiseptics left off; temperature fairly normal. July 11th, sent out in Thomas' splint and patten, still a sinus. November 20th, in good condition, scabbed over, fair mobility, and good position; has been walking on it. February, 1886, slight relapse (*Fig. 21*).

Case 38. *Abscess. Femoral Disease.*—Andrew H., age 6 years 7 months. Admitted September 27th, 1882; readmitted November 15th, 1882. Duration two years; pain in left hip; was in hospital with extension soon after, and was relieved for a time; eight months ago pain

returned, with night starting. October 11th, developed chicken pox, and was sent home. November 15th, re-admitted; very much pain, getting worse; extension. 22nd, left leg in good position; no shortening; some swelling in front of joint; considerable mobility without pain; long prepuce. December 16th, Thomas' splint applied, pain and starting at once returned, so extension reapplied. Went on without improvement and with much night pain till March, when an abscess appeared. On the 22nd excision; abscess contained $\frac{3}{4}$ pint of pus; section through trochanter; acetabulum smooth, and granulation covered, antiseptic; Bryant's splint; had night pain for first week, none after ten days; did fairly well; put up in Thomas' splint in middle of June. July 17th, sent out with patten and crutches in good health, plump, and hardly any discharge. January 26th, 1884, is well (*vide* Table).

Case 39. *Gouging. Abscess. Death*, 1885.—Eliza T. R., age $4\frac{1}{2}$ years. Admitted July 4th, 1882. No cause known for disease, which appeared about Christmas, 1881, with limping and pain in the knee. On admission, left thigh slightly abducted and rotated outwards; fulness in the groin; much thickening about the trochanter; not much tenderness. On July 12th a small channel was gouged through the trochanter into the neck to relieve tension in the bone (Croft and Greig Smith); a wire drainage tube was put in; operation antiseptic; extension; did well, and was discharged healed and free from pain in a Thomas' splint on July 31st. Since then abscesses have discharged; has had no pain when leg is quiet. On readmission, October 24th, 1882, scars of three healed sinuses; an abscess on outer side of thigh extending beneath Poupart's ligament; much thickening of trochanter; pain on anything more than slight movements which are free; no starting; limb straight; extension applied. October 27th, abscess opened antiseptically; $\frac{1}{2}$ pint of healthy pus. January 17th, has been doing well, but dressings became septic; 27th, the soft parts are much tunnelled with sinuses; counter openings made on two occasions. Feb-

ruary 3rd, excision as usual; head nearly all gone; a pulpy cavity in the neck of the femur, to which the gouge track led; acetabulum eroded; not antiseptic; subsequently discharge foul; temperature variable. March 8th, improving. April, in latter part again more discharge; condition in May somewhat hectic; sent out in July in an unsatisfactory condition.

Case 40. *Abscess. Femoral Disease.*—Jane H., age 7 years 8 months. Admitted February 9th, 1884. History phthisical. Injury to hip in December, 1882. No pain till June, 1883. Was in Children's Hospital in October, 1883, and was discharged with a Thomas' splint, which she has worn since, getting about with patten and crutches. On admission, not a strong looking child; left hip disease; abscess; $\frac{3}{4}$ inch shortening. February 14th, excision; acetabulum rough; head of femur partially destroyed; lower and inner part, including part of the diaphysis, eroded; bone beyond mottled, in parts rarefied, others anæmic; iodoform and salicylic dressing; abscess drained. March 7th, abscess wound healed. 23rd, tube left out. 27th, wound healed; shortening $1\frac{1}{2}$ inch. The wound again discharged, but in August, 1884, she was seen with it almost healed. General condition good.

Case 41. *No Abscess. "Caries Sicca."*—James P., age 4 years 1 month. Admitted July 12th, 1884. History phthisical. Duration, nine months. No cause known. On admission, fairly nourished; rickety; right hip disease. July 17th, excision; no definite abscess, but masses of granulation tissue; subchondral caries; cartilage thinned; epiphysis pale, hard, and rather transparent-looking. August 13th, wound healed; general health good; a good deal of thickening yet. February, 1885, had a fresh injury to the hip, which has discharged again, and is not yet healed, but he is doing well; has lately had a little pain. March, 1885, is now healed (*vide* Table. Fig. 12).

Case 42. *Abscess. Sequestra. Erysipelas.*—Mary E. S., age 7 years 2 months. Admitted October 28th, 1883. Personal and family history good. Duration, nineteen

months; fall; under treatment sixteen months; abscess a few months. On admission, delicate-looking child; left hip disease; abscess. October 31st, abscess aspirated. November 19th, excision of hip; sequestra in acetabulum; most of femoral epiphysis gone; antiseptic. December 10th, erysipelas; did well. January 23rd, 1884, got up with patten. Discharged nearly healed on February 14th. February, 1885, wound almost dried up; condition and mobility good (*vide* Table).

Case 43. *Abscess*.—Catherine S., age 6 years 11 months. Admitted March 19th, 1884. No phthisis; no cause known. Duration, two and a quarter years. Was in Children's Hospital in 1882 and 1883. Abscess three weeks ago. On admission there is shortening; wasting, flexion, stiffness; abscess. March 27th, excision through trochanter; spray and salicylic silk; bore operation badly; subsequent collapse; did well; sent out with sinus in a Thomas' splint May 19th. February, 1885, sound and well; in good condition; walks (*vide* Table).

Case 44. *Synovial Disease. Abscess. Supra-trochanteric Section*.—George R., age 2 years. Admitted June 21st, 1884. History good. Duration, seven months; fall; was well for six weeks, then had measles; on getting up hip became worse; abscess, four months. On admission, limb flexed; adduction and outward rotation; abscess, no shortening, very little pain, trochanter slightly thickened. June 26th, excision of hip; head and neck removed, not trochanter; acetabulum lined with granulations; cartilage over head smooth, but rather red and mottled; bone healthy; synovial membrane replaced by granulations; thick pus in abscess cavity; spray and wood-wool dressing; did very well; all healed on July 19th; quarter of an inch shortening (*vide* Table. *Fig. 14*).

Case 45. *Abscess. Incision. Femoral Disease*.—Fred L., age 8 years 2 months. Admitted November 26th, 1883. Phthisical history. Fall. Duration, four years. In Children's Hospital in 1881; abscess, joint incised; healed up and remained sound for twelve months; ten months ago

had falls again and got worse. Extension and Thomas' splint; now much pain. On admission, pale and delicate; right hip disease; abscess and sinus; three-quarters of an inch actual lengthening. 30th, excision of hip; acetabulum healthy; part of head of femur gone; one or two caseous patches with hyperæmic bone around; at line of section bone soft. Abscesses opened separately. Sublimate lotion, no spray. Did well. Discharged January 8th, 1884. February, 1885, healed to a small superficial sore. General condition very good (*vide* Table).

Case 46. *Abscess. Sequestra*.—James B., age 8 years 7 months. Admitted June 4th, 1883. Phthisical history. Duration, two years. No cause. On admission, left hip disease. Sent out relieved in Thomas' splint July 30th. Readmitted November 21st, abscess. November 30th, excision. Head of bone nearly all gone, disease below epiphysial line, acetabulum bare, some small sequestra; antiseptic. January 31st, 1884, antiseptics left off. Discharged February 3rd in crutches. February, 1885, sound and well. No pain. $1\frac{3}{4}$ inch shortening, but this is entirely from pushing up of the femur; no real shortening. Mobility fair. Walks on the leg for ten minutes daily. May, 1886, as above (*Figs.* 13, 50, and 51).

Case 47. *Abscess. Much "Rarefying Ostitis."*—William T., age 5 years. Admitted February 20th, 1884. Duration, two years. On admission, pale and unhealthy; phlyctenular ulcers; lungs? tubercle; left hip disease. 28th, excision; bone very soft, both femur and acetabulum; thick pus oozed up from a cavity running down by the side of the shaft; epiphysial cartilage loose; soft granulation patches in diaphysis; trochanteric epiphysis diseased; shaft below section quite soft and rarefied; did well; put up in Thomas' splint on April 2nd; discharged nearly healed on April 26th. February, 1885, in excellent condition; a small superficial sore alone remains; dry, February 11th, 1885 (*vide* Table).

Case 48. "*Caries Sicca*" of Femur.—Herbert C., age 7 years. Admitted September 18th, 1884. History good.

Duration, two years; injury; walked lame one month later. On admission, left hip disease; was sent out on October 1st, and readmitted October 29th worse. November 6th, excision; disease both above and below epiphysial line; subchondral caries; acetabulum healthy; iodoform and wood-wool; antiseptic. December 1st, spray left off; discharged in Thomas' splint on 10th. January, 1885, still sinuses and much thickening (*vide* Table. *Fig.* 16).

Case 49. *Pus in Joint*.—John B., age 4 years. Admitted January 15th, 1884. History good. Duration, three months; no cause. On admission, pale; left hip disease. January 31st, Thomas' splint applied and boy discharged. February 16th, readmitted, much worse; 21st, excision; subchondral caries; pus in joint; bone mottled; acetabulum bare; operation antiseptic; salicylic silk. March 12th, tube left out. 20th, wound superficial. April 2nd, got up. Discharged April 5th. July, 1884, there was an abscess in front of the excision wound with a good deal of glandular enlargement (*vide* Table. *Fig.* 7).

Case 50. *Abscess. Two Foci of Disease. Sequestra*.—Fred. W. B., age 2 years 8 months. Admitted June 9th, 1884. History good. Delicate child; measles eight months ago. Duration of disease, eight months. Abscess one month. On admission left hip disease. June 19th, excision; abscess in front of thigh; a sequestrum was removed from the shaft below the line of section; the epiphysis was healthy, except just adjoining the epiphysial line at one point; below this a large caseous granulation area enclosing three hard loose sequestra, disease chiefly at inner part of neck; cartilage yellow and rough; acetabulum fairly healthy; spray and wood-wool; did very well; wound healed on July 14th; shortening then $\frac{1}{4}$ inch; Thomas' splint; a good deal of thickening yet remaining. Went to Southport Convalescent Hospital for nine weeks; after his return the hip got worse and discharged again; was in hospital a fortnight and then sent out in a Thomas' splint. February, 1885, very slight serous discharge; in good condition, but some thickening (*vide* Table. *Fig.* 23).

Case 51. *Abscess. Femoral Disease.*—Alice R., age $4\frac{1}{2}$ years. Admitted September 23rd, 1884. History good. Duration, twelve months. Had measles at two years old and otorrhœa twelve months ago. On admission, well nourished, but pale; right hip diseased; swelling, but no obvious abscess; extension. October 17th, abscess. October 23rd, excision; antiseptic; bone mottled above and below epiphysial line; subchondral caries; cartilage quite loose, and in one spot perforated; acetabulum rough in one spot. November 24th, spray stopped; 1 inch shortening; wound almost healed; sent out in Thomas' splint on 28th. February, 1885, hip sound and well (*vide* Table).

Case 52. *Abscess. Sequestra.*—Mary F., age 4 years. Admitted October 23rd, 1883. History good. Duration, seven months; fall. On admission, delicate, pale; right hip diseased; no definite abscess; Thomas' splint applied, and she was discharged November 10th. Readmitted December 29th; abscess. January 10th, 1884, excision; head of bone almost gone; bone below hyperæmic and rarefied; a cavity at lower and inner part of neck; two small sequestra in acetabulum; spray; did fairly well for a time, but after the end of March the wound became pale and flabby and no progress was made, and she remained without much change on her discharge, June 21st (*vide* Table. *Fig.* 25).

Case 53. *Sinus. Supra-trochanteric Section.*—Matilda H., age 7 years 9 months. Admitted September 17th, 1883. History good. Duration, three to four years. Abscess one year later. Healed and broke out again three weeks ago (?) after fall. Had scarlet fever at six and three-quarter years and measles at seven years old. On admission, healthy looking. Left hip diseased; $\frac{3}{4}$ inch shortening; a sinus between trochanter and tuber ischii. Put up in Bryant's splint. September 22nd, position better, free discharge. October 4th, explored, joint destroyed; head of bone rough and bare; acetabulum rough. 11th, remains of head of bone removed through enlarged sinus; tro-

chanter not taken away. Discharged, nearly healed, January 23rd, 1884. January, 1885, sinus dried up. General condition very good.

Case 54. *Abscess. Two Foci of Disease.*—Ernest T., age 8 years. Admitted November 4th, 1884. History good. Duration, twelve months; no cause known; no pain. On admission, left hip disease; abscess; $\frac{3}{4}$ inch shortening. November 14th, excision; bone mottled, cartilage thin and eroded, a patch of disease in the shaft; acetabulum bare and rough; gouged. Wood-wool and iodoform. December 16th, sent out in Thomas' splint; not yet healed. February, 1885, still sinuses, but very little discharge. General condition fair.

Case 55. *Abscess. Aspiration.*—Susan M., age 10 years. Admitted January 15th, 1884. Was in Children's Hospital in 1883. On admission, delicate girl; left hip disease, abscess; extension applied. February 10th, abscess aspirated. March 10th, abscess partially refilled. Sent out March 26th. Readmitted May 14th. Abscess refilled three weeks ago; skin thinned. May 30th, abscess has burst under an antiseptic dressing which had been kept on. June 12th, excision; cartilage of head gone, good deal of flaky pus, necrosed cartilage, etc., in joint, surface of bone eroded, cancellous tissue very dark coloured. Her general condition was not very good, and the wound did not do well up till the end of the month, when she improved. Was discharged with a sinus on July 29th. February, 1885, in good condition, but not quite healed.

Case 56. *Sinus. Much Pelvic Disease. Necrosis.*—Albert E. C., age 7 years. Admitted May 20th, 1884. History good. Duration, two years. An abscess sixteen months ago was opened and soon healed. On admission, thin, delicate boy; right hip diseased; sinus. May 28th, excision; pelvis extensively diseased; the innominate almost separated into its three parts at the acetabulum; many small loose sequestra; bone freely removed down to internal periosteum of pelvis; femur, cartilage gone; bone bare and rough, mottled; soft in parts, sclerosed in others;

under surface of neck soft and friable; did well; sent home on July 16th in Thomas' splint; wound contracted to a small sinus and well puckered in; no swelling; general condition better, but poor; $\frac{3}{4}$ inch shortening. February, 1885, still one sinus, but discharge is very little and getting less; general condition good.

Case 57. *Abscess. Two Foci of Disease.*—Herbert L., age 6 years 4 months. Admitted March 25th, 1884. Phthisical history. Duration, three years; fall. On admission, healthy boy; right hip disease; abscess. April 4th, excision; cartilage thinned but not gone; subchondral caries; acetabulum bare; femoral epiphysis pale and mottled; similar patch in neck at under part; got on very slowly; wound indolent. Discharged with wound unhealed, August 28th. January, 1885, still sinuses, but doing very well.

Case 58. *Sinuses. Sequestrum in Shaft.*—Lucy M'C., age $5\frac{1}{2}$ years. Admitted May 26th, 1884. History good. Duration, seventeen months; no cause known; abscess three months. On admission, delicate looking; left hip disease; sinuses; shortening $\frac{3}{4}$ inch. June 9th, excision; head of bone all gone except one small bit; a large sequestrum in upper part of shaft, which was turned out, leaving a cavity; did poorly for some time, better afterwards. August 24th, sinuses smaller; operation wound nearly healed; a good deal of thickening; sinuses do not look well. February, 1885, is improving, but not yet healed.

Case 59. *Abscess. Aspiration.*—Wm. H., age 4 years 10 months. Admitted March 21st, 1883. History good. Never well since scarlet fever at three and one-third years. Duration, eighteen months. On admission, right hip disease; general condition good. Treated with extension April 19th, and then sent out in Thomas' splint. Readmitted December 15th, 1883. From April to December went about on crutches with the Thomas' splint. Two months ago abscess. Six weeks ago the abscess was aspirated, it refilled, and discharged itself on 14th. Has

had otorrhœa for some months. December 15th, pale and tuberculous looking, sinus behind great trochanter. January 19th, 1884, excision of hip. Upper epiphysis almost gone; below epiphysial line bone rarefied in some parts, sclerosed in others. Acetabulum fairly sound. Washed out with chloride of zinc and made aseptic, salicylic silk dressing. Did well. March 19th, wound superficial. Discharged. Readmitted August 9th, 1884. Wound reopened one week ago. Limb flexed and adducted; is stiff; a sinus in old operation scar; $\frac{3}{4}$ inch shortening. The limb was straightened and he was discharged on August 30th. February, 1885, nearly healed; $\frac{3}{4}$ inch shortening in femur itself.

Case 60. *Abscess. Pelvis Necrosed. Erysipelas. Amputation.*—Robert B., age 7. Admitted May 28th, 1883. History good. Six months ago was kicked under right knee; six weeks ago had pain in hip; scarlet fever four months ago. On admission, strumous-looking boy; right hip disease, abscess. June 7th, abscess opened, found to track 5 inches down thigh, no obvious opening into joint. July 7th, fluctuation below Poupart's ligament. July 12th, hip excised; all cartilage gone except the marginal zone; epiphysis yellow (cheesy); acetabulum carious, a sequestrum the size of a pea in it, and a perforation through its centre, carious bone gouged away, and a largish cavity found on inner wall of pelvis; wound left open, and well drained; salicylic silk and iodoform dressing. Had chicken-pox at time of operation; this was so slight as to have escaped notice until he was on the table. Had subsequent high temperature. A fresh abscess was opened on 22nd; there was much discharge, but up to September 3rd he was doing fairly well; his T. then rose, and some bogginess appeared in front of thigh; subsequently erysipelas appeared, and the wound became sloughy; a cardiac mitral bruit was heard on 13th. T. high until 20th, he then improved, though T. kept high at night; the limb then became œdematous and flabby with swelling about upper end of femur, and wounds did not heal. February 25th,

1884, much thin discharge; boy is very anæmic; wounds not healing; urine, no albumen. March 13th, as the leg showed no sign of improving, and the boy was not getting on, amputation at the hip was done by Furneaux Jordan's method, after previous ligature of the common femoral; the various cavities, etc., were cleared out, and the wound, after washing out with mercury lotion, was dressed with iodoform and oiled lint. There was considerable new bone formation round the upper end of the femur and an attempt at a new formation of cartilage there; soft parts very boggy. Operation was borne well. He very rapidly picked up, and, though there was a good deal of discharge, his colour improved, and he was discharged on April 8th with sinuses gradually closing.

Case 61. *Abscess. Incision. Sequestrum. Subsequent Excision.*—Phœbe O., age 8 years 11 months. Admitted November 28th, 1881. Duration of disease, five years; pain always in groin; swelling first appeared six weeks ago. Had been treated with extension and plaster of Paris. On admission, fairly healthy-looking child; left thigh fixed, much flexed and abducted; a large abscess on the outer side of the thigh; no pain day or night. December 18th, was put in a Bryant's splint, and the abscess was opened; about oz. iv. of pus were discharged and a small piece of bone. March 14th, wound nearly superficial. Was discharged on March 18th. *Subsequent history.*—Did well for a time, but later the disease progressed, and in January, 1883, the upper end of the femur was excised; both it and the pelvis were extensively diseased. The abduction in the third stage is worth noting.

Case 62. *Sinus. Some Repair. Cellulitis. Secondary Hæmorrhage. Death.*—John T. G., age 9 years. Admitted 23rd December, 1884. No tubercular history; had measles at three years old; five and a half years ago had a fall; has been an out-patient at the hospital for four years; one month ago an abscess opened; he was treated by extension at first; since the abscess opened has had on a Thomas' splint. On admission, considerable

left trochanteric thickening; the trochanter is drawn up; there is a sinus in front of the thigh discharging a little pus; one inch shortening. On 30th the T. rose to 102 deg., and next day to 102·8, and continued high though fluctuating till 5th of January, 1885; no cause could be found for this except the hip. 5th January, limb in fair position; excision; under chloroform there was very little mobility, no grating, free discharge from the sinus; bone at infra-trochanteric section harder than usual; operation more difficult than usual from matting together of parts; all the epiphysis was gone except one small piece, and the epiphysal cartilage was exposed; the acetabulum was much widened and its cartilage gone, but fairly healthy; a good deal of repair had gone on; iodoform and wood-wool dressing, no splint; one vessel was twisted; abscess cavity and wound dressed separately. 6th, there was considerable oozing. 7th, much discharge, and a good deal of clot in wound. 9th, T. 102·6; there is some inflammation about the groin spreading up to the abdomen. 10th, incision made in the groin and some pus let out. 11th, there is diffuse cellulitis; fresh incision made. 12th, looks very ill; foot swollen; up to 18th he improved, and the wound cleaned up and looked healthier; on the afternoon of that day profuse bleeding came on suddenly, which had ceased by the time the house surgeon came, but the boy died half an hour after the bleeding began. P.M.: Groin only examined; large sloughs were separating from the wound, and an opening the size of a pin's head was found in the femoral artery just below the origin of the profunda (*Fig. 19*).

Case 63. *Abscess. General Tuberculosis. Death.*—Bessie K., age 6 years. Admitted Dec. 23rd, 1884. No tubercular history. Two years ago fell down stairs; four months after this she began to limp, and has been gradually getting worse. She has been treated with extension since the first, and was in a local hospital for three weeks; has been in failing health. On admission, left leg abducted and rotated outwards; there is fulness in front of the groin, and considerable pain

on palpation, with deep fluctuation; considerable thickening round great trochanter; joint rigid; $\frac{1}{2}$ inch shortening; extension was applied till January 5th. January 5th, excision; about $1\frac{1}{2}$ ounces of cheesy pus escaped on the first incision; usual operation; the cartilage of the head was thinned and detached; the bone below pale as far as the epiphysial line, and disease had spread below this for a short distance; healthy at line of section; one small patch of diseased bone was gouged out of the acetabulum; antiseptic dressings of wood-wool. All went on well till February 2nd, when there was much discharge; T. 103.2; spray left off; has a bed sore. 6th, still much discharge; T. last two nights has reached 103 deg.; the child seems worse generally; wound looks healthy. 9th, still much discharge; wound pale and flabby; T. 101; normal again in the morning. 16th, T. has been high, but she takes her food well and the wound looks healthier; the bed sore is healing. 23rd, has been more apathetic and drowsy the last few days, and complains of occipital headache; T. ranges 98.4—100.8; abdomen not retracted; skin fairly elastic; P. 88; R. 20. *Tâche cerebrale* marked. 25th, has been irritable, but is less so, and is now very drowsy, with pain in the head; P. irregular; does not take food well. 28th, frequent screaming; wounds look well; T. 103.2 and 102. March 2nd, is worse; head retracted, breathing irregular; P. 120, irregular; no squint or convulsions; pupils widely dilated, face flushed; quite unconscious. She continued much in this state till 4th, when she died. P.M.: *Thorax*, glands enlarged; some caseating; left pleura contained about 1 ounce of clear fluid; no tubercle; right, a few recent adhesions at the apex; no fluid or tubercle. R. lung, tubercle freely scattered about surface, with a few nodules in apex and base, where there were also grey tubercles. L. lung, in much the same condition, but not so bad. *Abdomen*, a few scattered tubercles on the surface of the liver and kidneys; otherwise healthy, except some enlargement of lymph glands. *Head*, some external hydrocephalus and general congestion of brain; a quantity

of yellowish lymph at the base, most abundant about the optic commissures and pons, also along Sylvian fissures; tubercles were scattered about, especially along the Sylvian fissures. The left lateral ventricle was distended with turbid serum; right, contained less fluid. Tubercles (?) in choroid plexus; cord not examined.

Case 64. *Several Foci of Disease. Perforation of Pelvis.*—Ada W., age 6 years. Admitted August 21st, 1884. No tubercular history. Twelve months ago began to limp; no cause known; has been wearing a splint nearly the whole time. On admission, fairly healthy-looking girl; right leg slightly wasted; movement very limited and painful; no shortening; considerable trochanteric thickening; no abscess. Extension was applied, and afterwards she was sent home in a Thomas' splint on 30th. Readmitted December 22nd, 1884. Has not improved since discharge; there is frequent night crying. On admission, the splint was taken off and extension applied again; there is fulness in the groin and trochanteric thickening; veins swollen; $\frac{3}{4}$ inch shortening; movements very painful and restricted. January 8th, 1885, excision, infra-trochanteric section; the acetabulum was perforated, and the surface rough; the cartilage of the head was nearly gone, the bone being pale and eroded; mottling extended below epiphysial line, and just below this were two separate centres of caseation; bone at line of section healthy. All went on well. January 27th, wound healed, but there is an abscess in front of the thigh. February 23rd, abscess opened; some fever followed, but this soon subsided, and she was sent out in a Thomas' splint on March 16th with only a superficial wound. February 23rd, 1886, still a sinus.

Case 65. *Pus in Joint. Purulent Infiltration of Bone.*—Thomas S., age 6 years. Admitted December 20th, 1884. Tubercular history; a healthy child; six or seven months ago fell and hurt the hip; was lame for a day or two and then apparently well till 7—10 days after, when he began to limp again; had little pain. On admission, right leg semiflexed and adducted; much fulness and some fluctua-

tion over front of joint; trochanteric thickening; $\frac{1}{4}$ inch shortening (?); extension applied. January 15th, 1885, excision by posterior incision, head and neck only removed; there was pus in the joint; the bone on section of the neck was found to be hard and infiltrated with pus, so the wound was enlarged and infra-trochanteric section made; even then a purulent focus was gouged out of the shaft; epiphysial cartilage replaced by granulation tissue; one caseous patch in the upper epiphysis; the rest inflamed, but not cheesy; much pus in the abscess in front of the joint; the disease apparently began just below the epiphysial line and spread downwards and upwards; possibly the epiphysial focus was a separate one; acetabulum granulation lined; otherwise fairly good; operation antiseptic; T. never above 100 deg. after first three days; did well. Sent home nearly healed on February 18th.

Case 66. *Disease of both Hips. Double Excision.*—Charles L., age 5 years. Admitted 22nd April, 1884. No tubercular history; no previous illness; at Christmas, 1883, began to limp, and has got worse since; night crying; has had extension on at home without relief. On admission, healthy-looking boy; there is pain in the right hip and knee; limb straight (from extension); some thickening about trochanter; joint rigid; no shortening. He developed scarlet fever on May 5th, and was sent to the fever ward. Readmitted November 12th, has been getting worse since discharge, and has much night pain. On admission, slight adduction; trochanteric thickening; the least movement is painful; 1 inch shortening; deep fluctuation at front of joint. 27th, under chloroform, grating was felt in the joint; excision; a quantity of thick pus escaped; infra-trochanteric section; operation antiseptic; wood-wool dressing; all cartilage was gone from the head of the femur, which was extensively eroded and very pale, except at the epiphysial line where there was a zone of congestion; femur below deeply mottled; shaft healthy below section; acetabulum extensively diseased; several large pieces

gouged away; there was some bleeding in the evening, and an artery was twisted, after this he did well; spray was left off on December 30th, and on January 9th he was taken out of his Bryant's splint; it was then found that there was pain on movement and fulness round the trochanter on the other (left) side. January 24th, right hip quite healed, does not complain of left hip. 29th, an abscess over left hip; excision of left hip, much pus escaped; operation as on the other side; a piece of diseased bone had to be removed from the shaft of the femur; the head of the bone was pale and soft, with cartilage peeling off; bone below epiphysial line mottled; acetabulum superficially diseased; limbs put up in a Hamilton's splint; all went on well till March 8th, and the wound was healing fast; on that day T. rose to 102·2, and he vomited, refused his food, and complained of headache; P. 120; R. 36; breath sounds blowing over left scapular region. 12th, is better again; some discharge of sero-pus; swelling and hardness of thigh less. 15th, sent out in double Thomas', with wound in left hip still unhealed. April 6th, 1886, right hip well; left, three sinuses, is improving.

Case 67. *Abscess. Posterior Incision.*—Bertha B., age 7 years. Admitted 2nd August, 1884. No distinct tubercular history; child always well till three years ago, since that time has been ailing; had measles and whooping cough at four years, with occasional otorrhœa since; eighteen months ago, without known cause, began to limp, had not much pain, at first there was some in the knee but it is now in the hip; was in the Birkenhead hospital for eight months with extension. On admission, thin, delicate child; right leg extended; muscles wasted; leg is kept stiff, but can be rotated slightly without pain; flexion is painful; no shortening; trochanter slightly thickened; extension was applied for a few days, and on August 6th she was sent out in a Thomas' splint. Readmitted February 19th, 1885, unhealthy, poorly-nourished child; leg fairly straight; there is trochanteric

thickening ; a large abscess over the joint ; no shortening ; movements very limited ; flexion very painful ; extension applied. February 26th, excision ; several vessels bled ; the incision was made at the back of the joint instead of the usual position over the trochanter, and it was not found so easy as usual to clean the bone ; infra-trochanteric section, acetabular cartilage scraped away ; on section the head was found entirely gone, as well as the epiphysial cartilage ; the bone below was pale and unhealthy ; the acetabular cartilage was loose, the shaft of the femur was healthy. Operation antiseptic. All went well till March 1st, when the wound became foul ; spray was left off and the wound washed out with sublimate lotion. May 7th, she was sent to the seaside in a Thomas' splint ; there were still sinuses ; The temperature was at times high from imperfect drainage of the abscess cavity. Readmitted July 9th, with the hip in bad condition and fresh suppuration ; she improved under treatment somewhat, but much thickening remained. She was sent out in a Thomas' splint on August 22nd. May, 1886, in hospital again with fresh abscesses but is improving, and general condition very fair.

Case 68. *Abscess. Femoral Disease.*—Albert O., age 7 years. Admitted February 19th, 1885. Tubercular history. Child had measles at three years, but recovered well. Eight months ago had a fall ; walked with a limp, but had no pain for three months ; then pain began in the hip and thigh ; has had extension for two months ; this relieves the pain ; no night crying since. On admission, fairly-nourished boy ; right leg slightly flexed and abducted ; fulness in the groin and considerable thickening round the great trochanter ; deep fluctuation in front of the joint ; joint rigid ; no shortening ; extension applied. 26th, excision ; infra-trochanteric section ; no bleeding of importance ; thick curdy pus escaped from the abscess ; antiseptic operation ; cartilage over the head of the femur was loose and in places thinned, but nowhere perforated ; there was a layer of granulations beneath it ; the bone was pale ; mottled at one spot ; the acetabular cartilage was loose ;

shaft healthy ; did quite well ; T. only once above 99°2 ; was dressed four times. March 20th, wound healed ; sent home in Thomas' splint. October 10th, 1885, has a sinus, but is fat and well ; to leave off splint. March 23rd, 1886, has still one sinus ; fat and well ; some adduction ; mobility through 30 deg. ; $\frac{3}{4}$ inch functional, $\frac{1}{4}$ inch actual shortening (*Fig. 8*).

Case 69. *Intercurrent Measles. Abscess. Necrosis.*—Robert B., age 7 years. Admitted February 28th, 1885. No tubercular history. Since two years old the boy has been subject to bronchitis ; six weeks ago had measles ; seven months ago had a kick on the left hip ; afterwards he complained of pain in the knee and walked with a limp ; has been kept lying in bed for six months, but no apparatus ; used to have night crying, but not lately ; was going on fairly well till attacked with measles ; since then much worse. On admission, a fairly-nourished and healthy-looking boy, well grown ; left leg flexed and adducted ; there is a good deal of thickening round the great trochanter ; a large abscess in the gluteal region ; shortening (?) $\frac{1}{4}$ inch ; movements painful and slight. March 5th, excision ; about half a pint of pus escaped ; on examining the wound with the finger a hole was felt just above and behind the acetabulum ; from this a few small sequestra were removed and the finger then passed into the joint where the head of the bone could be felt ; the section was then made in the usual way ; the acetabulum was found extensively perforated by another large opening separated by a narrow bridge of bone from the first ; the diseased bone was gouged away ; the wound drained and dressed with iodoform and wood-wool ; the round ligament was not entirely destroyed ; the cartilage over the head of the bone was thinned and loose in places, but not perforated ; a layer of granulations underlay the cartilage ; the bone was pale down to the epiphysial line, below this mottled and soft ; bleeding was somewhat free. 6th, there was a good deal of shock after the operation ; he went on exceedingly well ; free discharge at first, but this soon lessened, and the wound began to heal

rapidly. On the 9th of May a fresh collection of pus formed and was let out, a small sequestrum being found in the abscess cavity. May 13th, the wound is foul, spray left off. 20th, put up in Thomas' splint. 23rd, almost healed, except one sinus; $1\frac{1}{4}$ inch shortening; sent home. January 23rd, 1886, $\frac{1}{2}$ inch real, 2 inches functional shortening; good mobility; to leave off Thomas' splint; fat and well; almost healed.

Case 70. *Abscess. Pelvic Sequestra.*—Annie B., age 10 years. Admitted March 25th, 1885. Phthisical history. Always well till one and a half years ago, when she fell; walked with a limp afterwards and had pain in the thigh and knee. Has had extension on for twelve months; when the weight is taken off she cries much with pain. Appetite good, sleeps well. On admission, a well-nourished girl. There is considerable swelling round the upper third of the left thigh and a large abscess. A good deal of trochanteric thickening. Movements of the joint are painful. No shortening. March 27th, abscess opened. April 21st, T. rose to 102.2; tube found blocked with lymph. 28th, excision; acetabulum extensively diseased; several large sequestra lying in it, and its floor was perforated. The head of the bone was pale as far as the epiphysial line; the epiphysial cartilage was loose and destroyed by disease at one spot; below this the bone was soft and mottled; there was some softening and injection of the great trochanter. 30th, a good deal of blood and serum in the dressings. June 2nd, wound filling up; spray left off. 29th, wound almost healed; still thickening round the thigh. July 6th, wound healed, still much thickening; sent to Convalescent Hospital, where she remained for two months. Readmitted November 5th, has had much pain and discharge since leaving the Convalescent; can walk only a few yards on crutches; there are two sinuses discharging in the old cicatrix, and there is much swelling about the upper part of the thigh; about $\frac{3}{4}$ inch shortening. 21st, has had lead lotion and a Martin's bandage; the thickening is much less and there is very little discharge;

cannot lift the leg herself, but is fat and well otherwise. 28th, wound healing; sent out. July, 1886, was attacked with scarlet fever (*vide* Table).

Case 71. *Abscess. Pelvic Sequestra*.—Herbert B., age 5 years. Admitted November 12th, 1884. No tubercular history. Had measles a year ago. A fall nine months ago. Hip disease first noticed in June; has had much knee pain. The hip has been swollen for two months; there is some night crying. On admission, R. leg semiflexed, abducted and rotated outwards; a large abscess over the upper third of the thigh; there is thickening round the great trochanter and fulness in the groin; movements painful and very limited; $\frac{3}{4}$ inch shortening. November 20th, excision; a quantity of offensive pus escaped; usual infra-trochanteric section; head of bone much diseased; cartilage eroded; bone pale and mottled; epiphysial line irregular and thinned; bone below extensively mottled. Acetabulum perforated; several sequestra removed; section of femur healthy. All went on well except that there was a good deal of grumous discharge at first; the wound had healed to a sinus at the lower angle by January 6th, 1885, and he was sent out in a Thomas' splint on the 7th. T. once reached 102 deg. March 23rd, 1886, still a sinus, which has been scraped out (*Fig. 10*).

Case 72. *Abscess. Pelvic Sequestra*.—Elizabeth L., age 5 years. Admitted March 2nd, 1885. History good; a delicate child since eighteen months old; had measles one and a half years ago; six weeks ago fell down stairs; five weeks ago began to limp upon the right leg, with much pain in the thigh and night screaming. On admission, the right leg is fairly straight, some fulness in the groin and trochanteric thickening; no fluctuation; joint stiff; no grating on rotation, which is not painful; no shortening; extension applied, 4 lbs. was painful, so 2 lbs. was used. 6th, a Thomas' splint applied and she was sent home on the 8th. Readmitted April 15th, night crying and much pain in the hip; does not take food or sleep

well; right leg slightly adducted and rotated outward; there is thickening of the trochanter and fluctuation in front of the joint; $\frac{1}{4}$ inch shortening; extension applied. April 30th, excision of hip; the abscess was opened and the hip excised in the usual way, through the lower part of the great trochanter; there was considerable bleeding; the acetabulum was found almost entirely destroyed, and several large sequestra were removed from it; there was a perforation large enough to admit a finger easily; the pubic portion of the pelvis was loose, and an abscess cavity could be felt within the pelvis, from which a sequestrum was removed; the cartilage over the head of the bone was thin; the epiphysis had several irregular cartilaginous centres in it (rickets?), and the epiphysial cartilage was separating from the shaft; shaft and great trochanter healthy. May 22nd, wound healed except the drainage tube sinus. June 1st, put up in Thomas' splint; leg in very good position, 1 inch shortening, sinus not healed; sent home on June 2nd. Readmitted October 21st, six days ago fell and hurt the right shoulder; there is very free movement in the hip, but it is very painful, there is 1 inch shortening, the end of the bone projects and is tender (not exposed); there is an abscess in the groin. 29th, abscess opened. 31st, was sent to the seaside; both wounds still discharging. February 2nd, 1886, still sinuses.

Case 73. *Abscess. Pelvic Sequestra.*—Willie J., age 4 years. Admitted October 15th, 1884. No history known. On admission, the boy lies on his face with his legs flexed; right leg adducted, rotated inwards; right gluteal area swollen; movements very slight; trochanteric thickening; $\frac{1}{2}$ inch shortening. October 30th, excision; a loose sequestrum was felt in the joint at once on opening the capsule, and two more were removed from the acetabulum; the cartilage over the head was thin and loose, with subchondral granulations; on section bone pale and mottled; a moderate amount of pus escaped from the abscess; wood-wool dressing; all went on well except a few rises of

temperature in the first few days. December 3rd, he was sent out in a Thomas' splint with one small sinus and the wound puckering in.

Case 74. *Double Hip Disease. Excision of both Joints. Secondary Hæmorrhage.*—Henry H., age 2 years 9 months. Admitted March 25th, 1884. Tubercular history. Was well till three months ago, when pain appeared in the right knee; night startings followed; there has been no failure of health. On admission, fat chubby child; right leg flexed and stiff; attempted movement causes pain; there is night starting. Extension applied; went on well till April 27th, when he got scarlet fever and was sent to the fever ward. Readmitted July 28th, 1884. General condition fairly good. Right hip swollen; obscure fluctuation on outer side; trochanter thickened; muscles wasted; no shortening; limb flexed, abducted and rotated outwards; movements very limited and painful; urine not albuminous. 30th, had attacks of night starting last night. August 8th, abscess larger. 24th, abscess aspirated, $\frac{1}{2}$ oz. of curdy pus withdrawn. Sent out in Thomas' splint when the ward was closed on August 24th. Readmitted September 18th. Has had night pains; abscess distinct. October 10th, excision; abscess opened, infra-trochanteric section; head of bone extensively diseased; the cartilage was entirely eroded and the bone was pale down to the epiphysial line; shaft of the femur healthy; great trochanter and acetabulum healthy; antiseptic operation. 12th, T. 103; he did not do well; T. kept high and he remained feeble with a good deal of swelling about the thigh. On October 30th a fresh opening had to be made. On November 2nd, alarming bleeding came on, said to have lost 8 ounces of blood from the wound; on opening up the cavity in the inner side of the thigh a slough was found exposing the femoral artery; there was no more bleeding. 3rd, on removing the Bryant's splint it was found that there was disease of the left hip, the trochanter being drawn up and the limb rotated inwards and adducted. 10th, he has much improved; takes food well and wounds

are healing. 21st, has a double extension. January 17th, 1885, a fresh collection of pus was opened below Poupart's ligament. 25th, all the wounds still discharge, but he is doing fairly well. 29th, left hip excised. The head of the bone was extensively diseased, the bone being quite soft and breaking down (rarefying osteitis); the cartilage was almost entirely gone and the disease extended to some distance beyond the epiphysial line; there was a large abscess opened on making the first incision. He went on fairly well. February 4th, wound healthy, very little discharge; child looks better than he has for some time; T. 100—normal. 12th, wound septic; 26th, a fresh collection of pus in the right hip. March 9th, little discharge from either hip. April 20th, has been going on very well and gaining flesh. May 6th, both legs in good position. Sent to the seaside in a double Thomas' splint. May 8th, 1886, both hips sound and well. Boy fat and healthy looking; can bear weight on the legs with the splint on, not fully without; to leave off splint.

Case 75. *Abscess. Necrosis.*—Alfred F., age 4 years. Admitted April 2nd, 1884. No tubercular history. Child healthy till four months ago, when he had a fall. Lameness and pain gradually came on, and for three months he has been unable to walk. On admission, he is rather pale and somewhat rickety. Right leg. Some trochanteric thickening; no shortening; some muscular wasting; movements limited and painful; the limb is flexed and adducted; there is pain and night starting; has phimosis. He was circumcised, a Thomas' splint applied, and he was sent home on April 30th. Readmitted October 6th; for last few days the hip has been more swollen and red; has not lost flesh; general condition fair, but is somewhat thin. Right hip, more trochanteric thickening; fulness in groin; a large abscess over the outer side of the thigh; leg shortened 1 inch, adducted, and rotated inwards; much pain on palpation. October 9th, excision; a 4-inch incision was made over the great trochanter; about two ounces of thick pus escaped, section through lower part of trochanter; no

bleeding to speak of. Head of bone extensively diseased, cartilage entirely gone, except at the lower part, where it was eroded; the disease extended through the head to the epiphysial cartilage, and at one point on the inner side perforated this; otherwise it was healthy below. Great trochanter healthy. Some necrosis of the acetabulum, the largest piece removed being the size of a bean. Antiseptic operation, iodoform and wood-wool dressing. Bryant's splint. Some shock followed, but he was doing well the next day. The wound did well, and was dressed every few days till November 15th, when spray was left off; on 20th, the abscess cavity was opened on the front of the thigh. January 10th, 1885, a Thomas' splint was applied, and he was sent to the seaside on 12th. T. rose once to 102, otherwise only reached 100 two or three times. July 21st, 1885, sound and well; good mobility, nearly 2 inches functional, but no femoral shortening. September 29th, 1885, healed, straight, mobility through 50 deg.; general condition good; complains a little of the hip in the morning, not at any other time; no swelling.

Case 76. *No Abscess. Necrosis.*—Walter B., age 6 years. Admitted February 9th, 1885. No tubercular history. At 3 years old had hooping cough, never strong since; eleven months ago without known cause he began to limp and had pain in the knee; had been allowed to walk a mile to school up till Christmas. Has night crying. On admission, a thin, wasted, delicate-looking boy. The left leg is slightly flexed and adducted; there is trochanteric thickening and some fulness in the groin, but no abscess. Extension was applied, followed by a Thomas' splint on 15th and he was discharged. Readmitted June 22nd; the left leg is fairly straight; there is much trochanteric thickening and some fulness in front of the joint, with engorgement of the superficial veins. Excision. The disease was found to have extended $1\frac{1}{2}$ inches down the shaft; hence the section was made lower than usual; within the head was a large sequestrum extending down to the point of section; the shaft was rather soft at one point and was gouged.

The acetabulum was rough at one point, but there was no bone disease; very little bleeding; wood-wool and iodoform dressing. Spray. Did well; tube removed. July 6th—15th, wound superficial. 25th, sent out in Thomas' splint. April 13th, 1886, wounds healed, but has a residual abscess. General condition good; can just walk with help of a hand, but not well; very little mobility; to continue with patten and crutches.

Case 77. *Femoral and Acetabular Disease*.—Susannah W., age 10 years. Admitted June 17th, 1885. A sister has hip disease. Always healthy till six months ago, when the disease began; no cause known. Was in the Infirmary for two months with extension in January and February, has had no treatment since. She is losing flesh and cries at night. On admission, right leg fairly straight, but somewhat rotated out. Much trochanteric thickening and fluctuation in front of the joint. Movements very limited and painful; $\frac{1}{2}$ inch shortening. July 2nd, excision; several vessels twisted; the acetabulum was perforated and several sequestra were removed; the rough edges were gouged away. The cartilage of the head of the femur was loose and thin; below this was a narrow zone of hyperæmic bone; the rest of the head was pale and cheesy looking. Below the epiphysial line the bone was somewhat congested and presented in the centre a patch of cheesy matter. The trochanter was mottled in the centre; the shaft was healthy below the line of section. July 16th, wound looking very well and healing; not much discharge; tube taken out. 23rd, continues well. August 5th, discharged. She continued to do well at home; her sister, who had not had anything done for the hip, is slowly sinking of exhaustion. October 23rd, 1885, still one sinus; in good position; not much discharge; no pain; in bed still. June, 1886, fat and well; not quite healed; gets about.

Case 78. *Abscess*.—Robert C., age 5 years. Admitted July 1st, 1885. One child died of spinal disease. Always healthy till fifteen months ago, when he had a fall; was in Children's Hospital eleven months ago, and has worn a

Thomas' splint ever since ; has now night pain and is losing flesh, but his appetite is good. On admission, right leg is semi-flexed ; the foot is rotated in and supported upon its fellow ; there is considerable thickening of the great trochanter, and an abscess in front of the joint ; joint stiff ; attempted movement painful ; muscles wasted ; no shortening. Extension ordered. 6th, extension on ; cries occasionally at night. 23rd, excision ; head of bone partly absorbed ; almost bare of cartilage, and very rough ; acetabulum much roughened ; part of it gouged away ; the abscess lying in front of the joint communicated with it ; the opening was enlarged, and another made in front. On section the remains of the epiphysis are quite cheesy ; the bone below the epiphysial line, which is irregular, is mottled, and in some parts rarefied ; section of the shaft healthy. Wood-wool ; antiseptic ; Bryant's splint. 29th, anterior wound looking red and irritable, and is painful ; iodoform ointment applied. August 1st, both tubes shortened, and all stitches removed. 17th, tubes removed. 23rd, put up in Thomas' splint. 24th, much discharge from both wounds ; posterior wound flabby. Sent out. March 30th, 1886, a sinus at the excision wound ; general condition good ; has been lying down. May 5th, 1886, cannot walk yet ; $\frac{3}{4}$ inch functional ; no actual shortening ; mobility 35 deg. ; limb straight ; has good power in it.

Case 79. *No Abscess. True Pathological Dislocation.*—Thomas Fred. D., age 9 years. Admitted June 15th, 1885. Family history good. Child healthy till five or six months ago, when he began to complain occasionally of pain in the hip and had night starting. Has had a Thomas' splint on since February. Within the last month, since leaving off the Thomas, the leg has become flexed. On admission, left leg flexed and adducted ; the left foot is supported on the right ; considerable thickening round the great trochanter ; the joint is stiff, and attempted movement painful ; no abscess ; muscles wasted ; no shortening. June 27th, sent home in a Thomas' splint. July 18th, readmitted. While at home has been in much

pain, with night crying; has a very poor appetite. On admission, when the splint is off the leg is slightly flexed, abducted, and rotated outwards; movements very painful and limited; no fluctuation; considerable thickening round great trochanter. Thomas' splint applied. 23rd, under chloroform, grating felt in joint; excision, the limb being flexed and adducted; the head of the bone was found dislocated, the inner end of the neck of the femur resting upon the upper and anterior border of the acetabulum. There was no abscess; the surface of the neck where it rested upon the acetabular rim was roughened, and the border of the articular cartilage partly eroded. The cartilage over the head generally was smooth, with a dark soft spot at its upper part and round the margins. On section, the cartilage was almost entirely separated, especially above and near the margins. The bone under the soft part of the cartilage soft and pale, as was the whole epiphysis. Cut surface of shaft healthy, also trochanter; acetabulum only roughened slightly at one spot. Before the operation there was very great thickening about the trochanter; on making the incision the head was at once exposed, and found lying as described, *i.e.*, a genuine pathological dislocation nearly directly upwards. Dressing and splint as usual. August 5th, wound healed everywhere except round the tube. 17th, tube removed. 22nd, wound superficial; sent out with large wood-wool dressing on. October 10th, 1885, all healed; fat and well; no pain; to take off splint for ten minutes night and morning. February 16th, 1886, sound and well; no splint; no pain; $1\frac{3}{4}$ inch functional, no actual shortening; no mobility; a little adduction, but is fairly straight (*Fig. 9*).

Case 80. *Abscess. Necrosis*.—Frederick W., age 11 years. Admitted July 11th, 1885. Family history good. Child healthy until a kick one year and eight months ago. Has worn a Thomas' splint for the last twelve months when he was in the Children's Hospital; before this he was in the Infirmary, and had two abscesses opened. On admission, a fairly well nourished boy. The left leg is in good position;

there is considerable trochanteric thickening, a very large abscess round the outer part and back of the joint ; no shortening. 15th, excision ; usual method ; on opening the joint a small hole could be felt in the head of the bone ; there was some difficulty in freeing the head of the bone, and the shaft at the line of section was sclerosed ; an osteotome was used to sever the bone as well as a saw ; very little bleeding ; the acetabulum was smooth, partly covered by cartilage and partly by granulations. The head of the bone was covered by cartilage, except the hole already mentioned, and slight erosion in spots. The bone was healthy, except for one small sequestrum which lay in its centre, and to which the hole in the articular surface led ; the shaft was healthy ; the abscess contained thick curdy pus. Dressing, etc., as usual. Did well till 24th, when he had some pain in the groin above Poupart's ligament, and starting at times ; extension increased. 25th, pain worse ; extension increased. 26th, pain somewhat relieved by opium ; has some tonsillitis. 27th, Ext. Belladonnæ applied over groin. 31st, better in every way. August 17th, has been doing well ; some glandular enlargement in groin ; tube removed. 21st, second tube removed ; a large dressing applied to go out with. March 30th, 1886, one sinus ; no pain ; swelling subsiding ; nearly 1 inch functional, nil actual shortening ; not much mobility ; slight adduction ; good power. April 25th, walks fairly well and can stand on bad leg alone.

Case 81. *No Abscess. Much Femoral Disease.*—Abraham C., age 5 years. Admitted May 21st, 1885. History good ; always well till seventeen months ago, when he had a fall, complained of pain the day after, has frequently had pain in the knee and night crying ; appetite fair ; was in Children's Hospital a year ago, and sent home with a Thomas. On admission, the left leg is semiflexed and rotated outwards ; there is trochanteric thickening and rigidity ; extension applied. June 11th, cries occasionally at night. 18th, excision, usual operation ; the acetabulum was rough and the cartilage loose ; this with some detritus of bone was scraped away ; the head of the femur and the cartilage were

almost entirely eroded, leaving the bone rough and soft ; on section patches of cheesy matter were seen extending through the epiphysial cartilage and at one point reaching to the line of section, this was gouged away ; the epiphysial cartilage was irregular and separated from the rest of the bone on each side by a narrow zone of inflamed bone. Wound looked pale and inactive for a time, but subsequently improved, and was superficial by August 11th. August 21st, discharged in a Thomas' splint (*Fig. 20*).

Case 82. *Abscess. Several Sequestra*.—Elizth. B., age 3 years. Admitted September 22nd, 1885. History negative. No known cause. Has had pain in the hip for nine months. Had extension on for eight weeks. On admission, joint stiff and painful ; an abscess over the outer side of the trochanter ; the limb is flexed and adducted ; there is moderate wasting ; trochanteric thickening and very little mobility even under chloroform ; no night crying. October 8th, excision by usual method ; about an ounce of thick pus and lymph escaped, some of it flaky. The acetabulum was filled up with granulations, but was nowhere bare ; the head of the bone was flattened and distorted, the cartilage was still present, but thinned and discoloured ; there was a large cavity in the upper part of the neck and head containing two sequestra, a smaller cavity just at the level of the section through the great trochanter also contained a sequestrum ; no vessel was ligatured ; operation antiseptic, wood-wool dressing, Bryant's splint. October 9th, wound full of clot. 31st, Tube removed, much of the clot has been absorbed. December 17th, discharged in Thomas' splint ; wound healing rapidly. March 30th, 1886, all healed ; 1 inch functional, barely $\frac{1}{4}$ inch actual shortening ; fair mobility ; can lift leg ; good abduction and rotation ; less flexion ; is straight ; no swelling (*Fig. 26*).

Case 83. *Abscess. Large Sequestrum*.—Minnie H., age 7 years 6 months. Admitted September 19th, 1885. Family and personal history good ; had measles at six months old. Last Christmas had a fall, and has since had pain and limping ; has been an out-patient for two months ;

leg said to have got much shorter in the last few months. On admission, the thigh is flexed slightly and much adducted; there is no mobility; pain is now mainly in the hip—it was formerly in the knee; rima natium very oblique upwards, and to the opposite side (adduction); moderate wasting of limb; buttock not much flattened; about 3 inches apparent shortening, by measurement none, by Nelaton's line trochanter raised $\frac{3}{4}$ inch (due to thickening probably); great trochanteric thickening; some pain in front of knee, not definitely localised; general condition fair. There is sometimes night crying, but unless moved she does not complain much. There is a good-sized abscess above the trochanter in the gluteal region. October 24th, excision; usual incision; curdy pus and much lymph in the joint; all the cartilage is gone over the head of the femur; a large loose sequestrum, cheesy and greenish yellow, occupies the inner side of the neck from just above the epiphysial line to the level of the small trochanter; epiphysial cartilage all gone, except at the inner and outer extremities; about one-third of the head gone, the rest mottled; acetabulum rough; all cartilage gone, and bone bare and irregular; no perforation; no sequestrum. The abscess was full of cheesy lymph, and the original line of section, which was subtrochanteric, traversed the sequestrum, and the lower part was subsequently turned out of its cavity and the edges rounded off. Two large drainage tubes used; two sutures in the outer wound; no vessel tied. Operation antiseptic, spray and wood-wool; put up in Bryant's splint. There was severe shock after the operation, from which she did not fully recover for two or three days; did well. November 28th, wound had healed, and she was sent out in a Thomas' splint. March 27th, 1886, $\frac{3}{4}$ inch functional, $\frac{1}{2}$ inch actual shortening; limb straight; wound scabbed over; to leave off splint.

Case 84. *No Abscess. Much thickening of Trochanter. Sequestrum.*—Charles I., age 4 years. Admitted May 4th and June 15th, 1885. Family and personal history good. Duration of disease, twelve months; no cause known. Com-

plained of pain in the left leg and limped ; since then has gradually got worse ; screams at night ; has not walked for a month. On admission, is well nourished and healthy looking ; the left thigh is semiflexed ; there is rigidity and considerable trochanteric thickening ; $\frac{1}{4}$ inch shortening by measurement. May 16th, was isolated on account of some catarrh with a rash (? measles). Sent out in Thomas' splint on June 2nd, which he wore till readmission. Readmitted June 15th. Has been in much pain, and the swelling has increased since his discharge. On removing the splint there is some flexion and adduction ; more trochanteric thickening ; movement of joint very painful. 25th, a profuse pustular eruption over the left buttock, which disappeared, leaving deep-pitted scars, by July 20th ; treated with lead lotion. August 12th, Thomas' splint reapplied, and he was discharged. Readmitted October 21st ; has worn his splint since his discharge. On admission, limb straight ; no abscess ; much trochanteric thickening ; mobility painful. October 23rd, excision by usual plan ; no abscess ; about half the head gone ; cartilage loose ; a large loose soft sequestrum lying in front of the neck in a cavity filled with caseous granulations ; acetabulum granulation lined, bare at one spot ; cartilage roughened ; section of head and neck mottled ; no vessels tied. Operation antiseptic ; spray and wood-wool ; Bryant's splint ; not much shock. 25th, dressed for oozing. November 15th, still a large deep cavity ; not much discharge. The wound filled up quickly, and he was sent out in a Bryant's splint on the 28th, with the wound superficial. April 20th, 1886, nearly healed ; no pain ; cannot walk yet ; has corneal ulcers.

Case 85. *Abscess. Measles? General Tuberculosis. Death.* James W., age 2 years. Admitted April 18th, 1885. No tubercular history. Had scarlet fever at one year old and hooping cough at one and a half years. Three months ago without known cause refused to walk and had pain in the hip ; for one month there has been swelling, no night crying ; has had extension on for six weeks. On admission, the left leg is flexed, abducted and rotated outwards, the

upper third of the thigh is enormously swollen, measuring $13\frac{1}{2}$ inches against 8 inches on the opposite side ; there is fluctuation, movement of the joint fairly free. 22nd, abscess opened antiseptically ; about half a pint of pus escaped. May 4th, the wound was foul ; spray left off ; child not so well. 7th, evidence of consolidation at left apex ; excision of hip ; infra-trochanteric section, joint and abscess drained separately, wood-wool and iodoform dressing. The acetabulum was hollowed out, but there were no sequestra. The head of the bone had lost all its cartilage and was much eaten away. What remained was pale, the epiphysial cartilage was tunnelled through and in the shaft was a cheesy mass the size of a small pea ; around this the bone was pale, becoming rarefied and hyperæmic towards the great trochanter, which was eroded to some extent. 18th, the wound has been daily syringed out and looks healthy. 26th, a rash has appeared over the chest ; T. $101\cdot2$; the child was isolated. 27th, the rash has gone, no coryza ; there is crepitation over both lungs in front. 30th, diarrhœa came on. June 3rd, somewhat better. 8th, is getting thinner ; T. $99\cdot8$ — $97\cdot8$; R. 56 ; Bryant's splint removed ; chest shows crepitation and blowing expiration at both apices ; wound indolent. 20th, is going down hill. 29th, wound looks a little better, but is still flabby ; both legs swollen ; T. 100—normal. July 13th, has been getting steadily worse in general condition and in lungs ; died in the evening.—P.M.: Upper end of femur round and truncated ; covered with granulations ; some new bone on the outer side ; shaft healthy on section ; acetabulum smooth and covered with granulations ; condition of parts fairly satisfactory. Lungs, studded with yellow tubercle ; a small abscess in right lung. On section the lungs were tubercular throughout, the masses breaking down and forming cavities 1 inch in diameter ; in some places almost solid from tubercle. Mediastinal glands much enlarged and caseous. Liver, a few small tubercles. Kidneys large and somewhat pale ; capsule strips easily. Spleen, studded with tubercles. Mesenteric glands enlarged

and congested throughout; some ascitic fluid; no tubercles in peritoneum (*Fig. 22*).

Case 86. *Periarticular Abscess. Femoral Disease.*—Esther M., age 7 years. Admitted August 11th, 1885. Phthisical history. Disease began in February, 1885; no cause known; has been under treatment as an out-patient for some time. On admission, right leg flexed, adducted, and rotated outwards; there is muscular wasting and much pain in the knee. Extension was applied until the 21st, and she was then sent out in a Thomas' splint. Readmitted December 23rd; has been fairly well since her discharge, but has occasional night pain; limb straight, rigid, no shortening; a small abscess below the anterior, superior spine. January 1st, 1886, excision; head of femur rough and bare, all the cartilage gone; epiphysis pale and carious; acetabular cartilage thin and loose; a patch of bare bone; the abscess, which could not be found to communicate with the joint, was full of thick gelatinous pus; the cavity was scraped out and drained; operation antiseptic. February 20th, wound healed; sent home in a Thomas' splint.

Case 87. *Abscess. Pelvic Necrosis.*—Charles F., age 8 years. Admitted December 5th, 1885. History good. Duration of disease, twelve months. No cause known. First symptoms were limping and pain in the right groin. He has been an out-patient for four months, wearing a Thomas' splint. On admission, limb slightly adducted; a large abscess in the front of the thigh; great pain on any attempt at movement, pain chiefly in the groin; there is flexion and rigidity; some trochanteric thickening. 10th, excision; under chloroform there was slight indistinct grating. On opening the joint a rough patch was felt on the upper and outer part of the head of the femur. At the upper and inner part of the acetabulum rough bone was felt; at the upper and outer part there was a large cavity reaching up to the anterior inferior iliac spine, in this were several cheesy sequestra. The abscess contained thick, curdy pus. The femoral articular cartilage was thinned and loose; the bone pale and mottled down to the epiphy-

sial line; a patch of rarefying osteitis lay below the line. ? Were there two foci of disease or was the pelvic mischief primary. Operation antiseptic; Bryant's splint applied; there was free bleeding as the incision had to be carried higher than usual to clear out the pelvic cavity. There was much sickness at first, and on January 11th an abscess had to be opened in the front of the thigh. He did well otherwise, and was sent home on February 22nd in a Thomas' splint, the wounds appeared to be all superficial. October, 1886, is again in hospital with several sinuses, but these are improving and his general condition is good.

Case 88. *Abscess. Cavity in Femur.*—Geo. H. G., age 7 years. Admitted January 19th, 1886. History good. Disease began without known cause eighteen months ago; has not walked for a year; was treated at home by rest in bed and a weight; last November was in hospital, and was sent out with a Thomas' splint. On admission, left leg in good position; there is an abscess just below and in front of the trochanter; no shortening; has pain in the knee when the splint is taken off. 28th, considerable trochanteric thickening; no grating; slight glandular enlargement; excision; about 2 oz. of pus escaped; cartilage about margin of acetabulum rough and eroded, but no bare bone; in the lower part of the front of the neck of the femur is a cavity large enough to admit the top of the thumb, this encroaches upon the head, and perforates the epiphysal line, reaching the articular cartilage, which is rough and villous, and here and there perforated, the cartilage is almost everywhere loose; a second focus of disease, grey and translucent, lies near the trochanter; did well. March 13th, sent home, only a small sinus remaining unhealed.

Case 89. *Abscess.*—Mary B., age 9 years. Admitted January 27th, 1886. History good. Duration of disease, five years, it came on after a fall; there has been no abscess. Two years ago she was in hospital and was sent out with a Thomas' splint, but would not keep it on, and has walked and played about. Two weeks ago an abscess began to

form. On admission, a pale but well-nourished girl. Left leg flexed, adducted, and one inch short. An abscess in the front of the thigh, and another one beneath the gluteus maximus, which is very tender; in this latter abscess is a pin-hole opening discharging pus. February 6th, abscess in front is pointing, and she has had a good deal of pain; the abscess was opened, and about 3—4 oz. of pus escaped; a Bryant's splint applied. 11th, excision: about three-quarters of the epiphysis was gone; bone pale; acetabulum rough and carious; did well. March 16th, wounds almost completely filled up. 17th, sent home in a Thomas' splint. Highest temperature after operation 100°2.

Case 90. *Abscess. Sequestra.*—Joseph R., age 4 years. Admitted February 24th, 1886. Family and personal history good. Duration of disease, eighteen months; no cause known. First symptoms lameness and pain in the knee; for twelve months had had swelling of the hip and has had night pain lately. On admission, a fairly healthy-looking boy; left leg flexed, adducted, everted, and considerably wasted; an abscess beneath the tensor vaginæ femoris; considerable trochanteric thickening; any movement is painful, and there is obvious grating in the joint. March 4th, excision; the abscess contained thin flaky pus; acetabulum rough and carious with many small sequestra; about a third of the epiphysis gone, the rest mottled; a wedge-shaped caseous patch reaching down close to the epiphysial line; operation antiseptic; temperature somewhat high at one time, and a fresh abscess found about April 14th. May 12th, almost healed. Sent home.

Case 91. *Abscess. Sequestra.*—Isaac R., age 5 years. Admitted January 6th, 1886. Family and personal history good. The disease began without known cause about Christmas, 1884. Has worn a Thomas' splint since April or May, and was in hospital for six weeks in August. Often has severe pain at night. On admission, right leg rotated outwards, movement painful; an abscess beneath the tensor fasciæ, pain chiefly about the middle of the thigh and just below the anterior superior iliac spine. November 23rd,

excision; under chloroform there was much grating on movement; acetabulum bare at one small spot, elsewhere granulation lined; head and epiphysial cartilage of femur gone; a cheesy greenish yellow sequestrum occupied the stump of the neck, below this was a zone of pale anæmic bone, and lower still a congested area; four small sequestra lay in the joint cavity; the abscess contained thick pus, and was drained and scraped out; operation antiseptic, iodoform and wood-wool dressing. December 16th, discharge foul. January 6th, doing well; sent out in Thomas' splint. Readmitted January 13th with more discharge; a gland in the groin subsequently suppurated, and in the latter part of March a good deal of acetabular disease was found. Sent home May 12th. October, 1886, still sinuses, and is unable to walk, but is decidedly improving.

Case 92. *Abscess. Sequestra. Advanced Disease.*—Wm. P., age 3 years. Admitted April 7th, 1886. Phthisical history. Duration of disease, twelve months; no cause known; had hooping cough nine months ago; pain has been in the knee and hip. On admission, is a pale, flabby child, but well nourished; right leg can be nearly but not quite extended; not much tenderness, if any; abduction the only greatly restricted movement; $\frac{1}{2}$ inch shortening; a large abscess round the hip, and much fulness in the iliac fossa. April 14th, swelling is increasing; no pain; takes food well; under chloroform, grating felt in the joint; excision; about two ounces of pus escaped; head soft and destroyed, represented only by a loose, cheesy sequestrum; marginal zone of cartilage partly left; some caseous detritus in the neck, extending down the shaft to below the line of section; two cheesy spots were scooped out; there were two sequestra lying loose in the acetabulum which was ragged, excavated, and tending to break up; operation antiseptic; a good deal of shock. On the 21st the antiseptics failed and there was a good deal of redness and swelling. May 31st, general condition good; still a sinus; to get up in Thomas' splint. Highest temperature 102 deg.

Case 93. *Abscess. Removal of Sequestra. No Repair. Subsequent Excision.*—Frank S., age 6 years. Admitted November 21st, 1885. Phthisical history. About five months ago had a fall. Three months ago pain and limping appeared. On admission, right limb very slightly flexed and rigid; a large abscess over the upper part of the thigh, where there is pain; extension applied; there has been some night crying. December 3rd, there is grating on rotation; the pain is just below the anterior superior iliac spine. The joint was opened and the cartilage of the femur found quite smooth; on passing the finger to the front and inner side of the neck, a rough bony surface could be felt, with a deep cavity occupying the neck and part of the head; from this hollow were taken four or five sequestra the size of small peas, and one of them, which was large, was found to have reached up to the epiphysial line; the cavity was cleaned out and the abscess drained; the acetabulum could not be explored. Operation antiseptic. He did well and was sent to the seaside on January 11th, 1886, with the wound nearly healed. He was readmitted on March 3rd with a sinus still open and much thickening about the hip. He improved considerably, and was sent home again on the 24th. Readmitted April 10th, 1886. The hip is swollen, hot, and red; there is great tenderness and pain on movement. On May 6th, as no marked improvement took place, the hip was explored; a probe led down to bare bone and there was grating in the joint; on passing the finger into the wound, the old cavity was felt unrepaired; the head of the bone was bare and rough. Excision through the neck, the trochanter being left undisturbed; section of the head showed it to be white and carious; the cavity in the neck showed no sign of repair; the acetabulum was smooth, but granulation lined. Iodoform and wood-wool dressing; no spray. The wound was foul, but he did well, and was sent home in a Thomas' splint on June 3rd with the sinus almost filled up.

Case 94. *True Pathological Dislocation. Reduction. Subsequent Abscess. Excision. Death.*—Charles H., age 9 years.

Admitted February 6th, 1886. Doubtful tubercular history; About two months ago he began to limp, but the history is untrustworthy, and it appears that there was an injury to the hip and lameness in the autumn of 1885. On admission, very pale and thin; the left leg is flexed, adducted, and inverted; there is thickening of the trochanter and some fluctuation in the groin; extension was applied. 11th, examined under chloroform; some of the swelling has gone down, and there is manifest dislocation of the hip upon the dorsum ilii; the rounded head can be felt very distinctly rolling under the finger; the limb is also in the position of dorsal dislocation; the displacement was readily reduced by manipulation, the head returned to the joint with a muffled jolt, the limb at once coming down into position; no distinct grating; flexion and inward rotation readily reproduced the dislocation, which was clearly a true pathological luxation without destruction of the head. 15th, a large abscess has formed around the joint; no return of the dislocation; general condition poor. 18th, the abscess and joint were opened; the head of the femur was found to be intact, except at the outer and anterior part of the articular surface, where there was a narrow rim of bare bone; the cartilage elsewhere was healthy; a counter opening was made at the back of the joint and the wounds dressed antiseptically. 22nd, he has not been doing well; temperature has ranged nearly to 104 degrees; the pulse has been weak and irregular, and some fresh suppuration has occurred necessitating more free drainage; the boy has much pain and is very fretful, requiring free doses of opium. 27th, large quantities of thin brown pus escape on pressure at the back and inner side of the joint. March 4th, a fresh counter opening was made, the Bryant's splint was renewed, and the boy put upon a water-bed as there was a tendency to bedsores in several places; he got steadily worse and the discharge became foul. As a last resort, and to allow of free drainage, the head of the femur was excised on April 1st, it was quite bare, and the bone pale and rarefied; acetabulum

bare, rough, and pitted. No improvement followed, and he died on the 15th. No post-mortem was allowed.

Case 95. *Abscess in Psoas, rarefying Ostitis. Fistula in Ano. Subsequent Amputation.*—James T., age 10 years. Admitted November 4th, 1885. Family and personal history good. Three months ago fell upon his side; two months after pain and lameness appeared; has had extension on for a month; has night pain. On admission, right leg adducted and rigid; attempted movement is painful; there is much swelling and tenderness about the trochanter, but no abscess; the pain is over the trochanter, the front and outside of the thigh, but is not localised; he has a fistula in ano. 9th, a weight and long splint applied. December 3rd, there is much hard thickening about the hip and great tenderness; no obvious abscess; no grating under chloroform; on cutting into the joint there was a free gush of slightly turbid serum, the cartilage was thinned, and getting loose; excision; there was a large amount of caseous lymph and granulation tissue in the joint, and an abscess on the inner side tracked up in the course of the psoas over the pelvic brim; acetabular cartilage smooth, but bone bare at the site of the Haversian gland; section of the femur showed the cartilage thinned in places, and where this was so the bone was pale; three or four patches of soft gelatinous granulation tissue "rarefying ostitis" were found scattered about; shock was considerable; operation antiseptic. He showed little power of repair either in the hip or fistula, which was laid open at the same time. On April 13th he was sent home. Temperature ranged high throughout. No repair. Amputation August, 1886. October, 1886, slowly improving.

Case 96. *Sinuses. Extensive Disease of Femur and Pelvis.*—George C., age 11 years. Admitted January 27th, 1886. Family and personal history good. Two years ago, without any known cause, he began to limp. One year ago an abscess appeared. On admission, general condition good. There are three sinuses in the left hip, two on the outer side and one in the groin, and one gluteal. There is

great thickening of the trochanter and parts around, also of the iliac fossa. No great tenderness; no mobility; no shortening; limb nearly straight. February 11th, excision; the head, trochanter, and upper end of the shaft were far advanced in disease, having nearly disappeared; the epiphysis somewhat less advanced than the rest; all cartilage was gone from the joint. Acetabulum perforated and contained a sequestrum. March 8th, pus escapes on pressure in the iliac fossa; doing fairly. The discharge continued to be free, and the parts were explored on April 8th and an abscess was found on the inner side of the thigh; wounds well drained. June 3rd, the boy has considerably improved, but the temperature is high at times; all tubes removed, and the boy sent home. Three weeks later he was readmitted with the sinuses still discharging and much thickening around the hip; a Martin's bandage was applied with good effect, and he was sent home in September in a Bryant's splint. October, 1886, he is still in much the same condition.

Case 97. *No Abscess. Much Femoral Disease.*—Elizabeth E., age 6 years. Admitted June 15th, 1886. Phthisical family history. Eight months ago, without known cause, she began to limp; has not walked for three months. On admission, left thigh flexed, adducted, and inverted; no definite abscess. 19th, extension applied, but as she had pain at night this was exchanged for a Bryant's splint, in which she was much easier. July 24th, a Thomas' splint was applied a few days ago; she has now much pain day and night. 29th, excision; acetabulum granulation lined; some thick lymph, but little or no pus in the joint; two-thirds of the femoral epiphysis gone; there were loose tags of necrosed cartilage in the joint; below the epiphysial line a partially caseous patch of bone, section healthy; operation antiseptic. August 30th, wound almost healed; highest temperature 99°6 degrees; a Thomas' splint applied. September 8th, sent to the seaside.

Case 98. *Much Trochanteric Thickening. Pelvic Necrosis. Death from Shock.*—Sarah Jane B., age 9 years. Admitted

July 21st, 1886. A tuberculous family history. The child herself always delicate; twelve months ago had a fall, and has never been well since; has had night pain. On admission, left leg everted; slightly shortened; enormous trochanteric thickening; grating felt under chloroform. August 5th, excision; head of femur rough; all the epiphysis gone; acetabulum necrosed and perforated posteriorly; several sequestra removed; much caseous lymph and pus escaped; a counter opening was made at the back; there was free bleeding; she suffered much from shock and uncontrollable vomiting, and died on the 7th.—P.M.: Heart pale; $\frac{1}{2}$ oz. of fluid in the pericardium; kidneys pale; capsule adherent; liver œdematous and sodden; left lung adherent to diaphragm; an abscess cavity within the pelvis opened through the perforated acetabulum and also through the sciatic notch. Temperature never above 99 deg.

Case 99. *Sinuses. Much Shortening. Useless Limb.*—Eleanor C., age 17 years. Admitted January 14th, 1884. History good. Seven years ago had a fall; there was a short "latent" period, then pain began. Six years ago an abscess discharged, and three years ago two more sinuses formed. On admission, there is mobility, but it is painful; there are sinuses and 4 inches shortening. January 21st, excision at level of small trochanter; head and neck of femur almost entirely gone. Acetabulum fairly healthy, but could be felt to be thickened on rectal examination. She did not do well, and there was some reactionary bleeding and high temperature. February 9th, erysipelas. In March, a second attack of erysipelas. She slowly improved, but now (October, 1886) has still sinuses and a short, useless limb. General condition good; gets about with crutches. This case would have been better treated by amputation at first.

Case 100. *Abscess. Comparatively Early Disease.*—John R. W., age $4\frac{1}{2}$ years. Admitted June 22nd, 1886. Family and personal history good. Injured the hip last Christmas, about a month later complained of pain in the knee and hip. On admission, hip flexed to 45 degrees; adducted and

rotated in; considerable trochanteric thickening; extension applied. June 25th, has night pain. July 8th, an abscess over the upper part of the great trochanter; under chloroform creaking but no distinct grating was felt; excision; about half an ounce of thick pus escaped on incision; on passing the finger into the joint the cartilage was felt to be thinned and the ligamentum teres gone; no bone actually bare; cartilage over head of bone thin and loose; epiphysis yellow and carious in centre and at joint surface; an isolated patch of cartilage in the epiphysis; shaft and epiphysial line healthy. July 10th, first dressing; still has some pain at night. August 1st, all going on well; put up in a Thomas' splint and sent out; wound healthy; highest temperature 98·8 deg. October, wound almost dry; is in excellent health; to leave off splint and take to patten and crutches.

APPENDIX II.

CASES ILLUSTRATING VARIOUS AFFECTIONS OF THE HIP ALLUDED TO IN THE TEXT.

CASE 1. *Hip Disease. Residual Abscess. No Operation. Cure.*—Alice R., age 3 years. Admitted January 9th, 1880; discharged April 20th, 1880. History: Eighteen months ago pain. Condition on admission: Flexion; no swelling; no grating. Treatment: Extension and long splint. Result: Good position; no starting; relieved. December, 1881, a large abscess above and behind the great trochanter; no pain except on firm pressure; rotation and abduction painless to a limited degree; shortening $1\frac{1}{4}$ inch; flexed to a moderate amount; labium flattened, hidden, and raised; gets about on her toes without pain, and has no crutch. The abscess was opened in April, 1882, and she finally got well with no further operation. 1885, joint stiff and the limb somewhat adducted, still an excellent result.

Case 2. *Hip Disease. No Operation. Good Result. Relapse after 4 Years.*—Charles L., age $5\frac{1}{2}$ years. Admitted August 6th, 1880; discharged December 5th, 1880. Family history of phthisis. Left hip. Duration: Eighteen months ago had a fall; got well; three months later limped; twelve months ago ceased to walk; three months ago an abscess appeared. Condition on admission: $1\frac{1}{2}$ inch shortening; adduction; rotation out; rigidity; little pain; one sinus. Treatment: Extension, which removed all shortening. Result: Wound healed; ankylosis; fat and well; sent home in a poroplastic splint. December, 1881,

in good general condition ; $1\frac{1}{2}$ inch shortening ; some little mobility ; much thickening about trochanter ; sinus healed soundly ; has never used a high-soled boot ; walks freely. 1885, has had a relapse, but joint is now again quiescent.

Case 3. *Hip Disease of Long Duration. Treated by Non-operative Method.*—Agnes I., age 15 years. Admitted February 26th, 1880; discharged March 9th, 1880. Family history good. Readmitted February 1st, 1881. Duration of disease, etc.: Ten years ago an abscess formed after a fall ; it was opened and healed up ; has been lame ever since. Condition on admission : Right leg shortened ; old cicatrices over upper third of femur occasionally discharge ; no record was kept of her. Result : In December, 1881, she was much in the same condition ; free from pain ; sinuses still open.

Case 4. *Hip Disease of 30 Years' standing. Sinuses Opened. Death.*—Walter J., age 45 years. Admitted May 26th, 1880 ; died August 2nd, 1880. History and duration of disease : Thirty years ago he fell from a wall, and soon after an abscess formed in the left thigh ; three years after got much worse and an abscess was opened ; for next twelve years had good health ; during last three years has got worse ; for last three months has been unable to work. Condition on admission : There are twenty-one sinuses ; the patient is very thin and anæmic ; urine sp. gr. 1002 ; no albumen ; left testicle swollen ; the leg is 3 inches shortened, adducted, and inverted ; spleen and liver slightly enlarged. Treatment : Sinuses laid open ; no dead bone found ; profuse discharge went on for some time, and the man died exhausted. This case illustrates the occasional prolonged duration of the disease, and the obstinate incurability of it, with tendency to relapse.

Case 5. *Hip Disease. No Operation. Tubercular Meningitis. Death.*—Emily B., age 1 year 11 months. Admitted December 6th, 1880 ; died January 26th, 1881. Duration of disease : Twelve months ago had a fall ; the limb became flexed and she had extension applied, then swelling appeared. Her mother said even then "she would

let you do anything with her *except put her boot on.*" She has had a cough and is wasting. Condition on admission: A large abscess; pain on pressure; no shortening. Treatment, etc.: Extension. December 14th, abscess smaller. December 18th, abscess fuller; temperature high. January 13th, abscess sac flaccid; temperature 100 deg.; is listless. 17th, torpor; vomiting; left optic disc hazy on outer side. Result: She gradually became comatose and died; at the last the discs were hazy and pupils dilated; temperature not high, but *very irregular*.—P.M.: Head, neck, and part of trochanter extensively diseased; a sequestrum of cheesy bone; a large abscess cavity. Brain not examined.

Case 6. *Hip Disease. No Operation. Tubercular Meningitis. Death.*—John Thos. M., age 3 years 6 months. Admitted August 3rd, 1880; died October 21st, 1880. Family history good. Left hip. Duration of disease: Had a fall in June, 1880; had measles also in June, and was lame when he got up after them. Condition on admission: Slightly flexed; some rigidity; pain in knee; abscess. Treatment: Extension. September 8th, vomiting and high temperature. 12th, albuminuria and casts. Temperature remained high through September and October, and he wasted much. October 14th, listless; screaming occasionally. 15th, spinal muscles rigid; temperature 100·6 deg. 16th, pupils dilated; discs (optic) swollen and hazy; breathing slow. Result: 21st, died.—P.M.: oz. iii. of curdy pus were taken from round the joint; there was soft caseous matter in the head of the bone; the cartilage was detached; acetabulum healthy; tubercular meningitis.

Case 7. *Hip Disease. Incision. Cure.*—Joseph K., age 9 $\frac{2}{3}$ years. Admitted July 10th, 1879; discharged November 25th, 1879. Family history good. Duration of disease: Four years ago had a fall; soon limped; six or eight months after swelling appeared; twelve months after an abscess was opened; three years ago in a hospital; three months ago abscess reopened. Condition on admission: Pale, thin; flexion, adduction, partially anchy-

losed ; pelvis tilted ; considerable lordosis ; a sinus below great trochanter. Treatment : Exploratory incision ; hip found ankylosed, with some bare bone round the acetabulum. Result : Discharged unhealed. Seen December, 1881, 1 inch shortening ; wound soundly healed ; no pain ; fixed flexion to 45 degrees ; no other deformity ; condition good ; much thickening about trochanter ; runs about without a crutch and with a high-heeled boot ; wound has been healed for nine months.

Case 8. *Hip Disease. Incision. Cure.*—Sarah F., age 4 years. Admitted November 7th, 1879. History: Fall ten months ago ; last nine months has limped ; was in bed for a little while and improved. Condition on admission: Pain and starting ; pain worse last few days ; flexion and adduction ; fulness in front, pain on pressure ; no shortening. Treatment : Extension. On 8th, sudden effusion into the joint took place and a subcutaneous incision was made into it. Result : Sent out in gum and starch splint ; no pain. December 6th, 1881, limb firmly ankylosed with some thickening ; no pain, except occasionally if jarred ; flexion at angle of 45 degrees ; about $\frac{1}{2}$ inch shortening ; walks well with sole thickened $\frac{1}{2}$ — $\frac{3}{4}$ inch ; general condition good. [There is still danger of relapse in such a case.]

Case 9. *Hip Disease. Incision. Nearly Well. Died of Tubercular Meningitis.*—Mary Alice D., age 8 years. Admitted November 6th, 1879 ; discharged April 5th, 1880. Duration of disease : Three months ago had a fall ; two weeks later was lame ; lately has had swelling and starting. Condition on admission: Flexion ; tenderness ; no abscess. Treatment : Extension. Later, night pain continued and fluctuation appeared ; the capsule was incised ; pain relieved, but returned in six weeks. Result : She was sent out relieved, and “seemed to get nearly well of her hip, only walking a little lame ;” but died apparently of tubercular meningitis in November, 1880.

Case 10. *Hip Disease. Drilling of the Joint.*—Harriet H., age 5 years 2 months. Admitted March 18th, 1882. Duration of disease : Six or seven weeks ; no injury known ;

has had pain and night startings; getting worse. On admission, "strumous"-looking child; left hip flexed and rotated slightly outwards, but no abduction or adduction; great trochanter thickened; night screaming. March 20th, head of femur drilled; no pus escaped. March 31st, wound superficial; symptoms relieved. April 4th, she was sent out in a Thomas' splint. In February, 1883, she was still wearing the Thomas' splint, and the hip was quite quiescent, though there was a good deal of thickening about it. February, 1884, is well, but joint is stiff, with slight flexion; she runs about and has no pain; $\frac{3}{4}$ inch shortening.

Case 11. *Hip Disease. Drilling of the Joint.*—Wm. W., age $7\frac{1}{2}$ years. Admitted March 8th, 1882. Never strong; no known injury; the disease was of six months' duration. On admission, well-nourished child; left thigh rotated out, flexed, and abducted; trochanter thickened; movements restricted but not lost; pain in knee; extension by weight. March 23rd, the upper end of the femur was drilled; pus was found upon the drill upon withdrawal; had some night starting for a few nights until the limb was extended between sand bags. On April 13th the dressings were removed, the puncture being healed. On April 19th he was discharged, all symptoms having subsided, but there was a good deal of thickening about the trochanter.

Case 12. *Hip Disease. Drilling of the Joint.*—John Thos. S., age 4 years. Admitted March 20th, 1882. Duration of disease: Twelve months. Slight swelling lately; night startings. On admission, delicate but well-nourished child; left leg flexed and rotated outwards; great pain on any movement; great trochanter thickened. Until July 12th the case was treated by extension, but the pain and night startings continued. July 13th, a small gouge was passed through the trochanter, neck, and head of bone. 14th, no pain. 17th, had night screaming; drainage tube removed. 28th, wound superficial; has been free from pain, and the hip seems quieter, with less thickening; discharged with a Thomas' splint and a crutch on July 29th. September 26th, at out-patient's; was in good position; still had some

pain ; there was considerable thickening around the hip, but less than there had been ; there was still an opening at the site of the gouging, and a small piece of bone had come away lately ; still had slight night startings ; general condition good ; had extension still on.

Case 13. *Anchylosis after old Hip Disease. Double Osteotomy.*—Frederick P., age 18 years. Admitted September 25th, 1880. Was in hospital off and on till March 8th, 1881. Family history good. History of disease : Four years before had pain in right leg ; abscesses formed in the back, and then over the right hip and left thigh ; the left leg was drawn up first, the right not very long after. Condition on admission : Both legs flexed and abducted so as to be at right angles to the trunk ; no sinuses unhealed ; firm anchylosis ; can only lie or sit across a chair. Treatment : June 18th, 1880, double infra-trochanteric osteotomy ; limbs brought straight. Convalescent November, 1880. Result : March 9th, 1881, right leg straight, 28 inches long ; left leg $26\frac{3}{4}$ inches long ; a considerable outward bowing at line of section 4 inches below anterior superior spine ; both femora firmly anchylosed to pelvis ; knees can be flexed nearly to a right angle and fully extended ; is able to sit comfortably, the pelvis tilting on the lumbar spine ; can stand steadily without help and walk a little ; generally gets about by walking with crutches ; has no pain ; general health good ; wears a high-soled boot on left leg. November 22nd, 1881, can walk very well and a good distance.

Case 14. *Injury to Hip. Interstitial Absorption of the Neck. Secondary Dislocation. No Suppuration.*—Wm. D., age 15 years. Admitted October, 1881. History : Previous good health. At Christmas, 1880, fell, while skating, on outer side of right thigh ; was able to continue skating afterwards and walk quite well. A week or two afterwards pain came on in the right hip, which was worst when he sat down ; the joint gradually became stiff. Condition on admission : Right thigh and leg rotated out and fixed ; no active mobility at the hip joint ; $\frac{3}{4}$ inch shortening ; buttock wasted ; under chloroform forcible movement was employed

and some adhesions gave way, limb afterwards very freely movable. A week later the shortening had increased to $1\frac{3}{4}$ inches; there was some mobility, but no rotation, and there was pain on pressure over the trochanter; slight inversion and adduction of limb. A fortnight later there was 2 inches shortening, and pain, which had existed before in the knee, still was there. Eleven days later, the head of the femur was found to be lying on the dorsum ilii or rather immediately behind the acetabulum, when it could be felt to move with the limb on rotation; there was much internal rotation, and flexion to a right angle was possible. There appears to have been interstitial absorption of the neck, and, later, capsular softening, leading to dislocation, as a result of passive movement.

Case 15. *Acute Periostitis of Femur extending to the Hip Joint.*—Annie P. was healthy till she was 10 years old, then had acute periostitis of the femur; swelling extended from the hip to the knee, then abscesses formed and discharged about the knee, and some bone came away and more was removed; later an abscess appeared about the hip, which burst, and from it the head of the femur was discharged; the sinuses finally healed eight years after, leaving her with a flexed knee. December, 1881, remains in same condition. [Here clearly the disease began as a periostitis, which involved the hip joint secondarily, and probably by extension of the disease the epiphysial cartilage was destroyed and the head of the bone separated. This case so far resembles Mr. Bryant's case of destruction of the greater part of the shaft and the head of the bone, with restoration of a movable limb.]

Case 16. *Acute Hip Disease. Death.*—Catherine D., age $10\frac{1}{2}$ years. Admitted June 5th, 1880. Died June 9th, 1880. Duration of disease: One week ago had a fall; was at school the day before admission, but had pain in the hip; delirious on the second day. Condition on admission: Shivering; delirious; P. 160; T. 105; swelling of upper part of thigh; veins turgid; skin œdematous; thigh slightly flexed; cries on movement; no grating; under chloroform

the swelling was punctured, no pus found. 10 p.m. the same night P. 200, very small; T. 105·2; R. 32; delirious. 6th, 10 a.m. tongue dry and brown; more swelling; at night sweating and screaming. 7th, apathetic; occasionally screaming. 8th, takes no notice of anything; T. 104·6; R. 52. 9th, at 4 a.m., T. 106·6; died.—P.M.: Grumous pus was found in the joint; the cartilage entirely destroyed in parts of the head of the femur. No further examination.

Case 17. *Acute Hip Disease. Excision.*—Margaret A., age 6 years. Admitted August 8th, 1881. Duration, etc.: Always a delicate child. Eight days before admission she fell and hurt her left hip. Condition on admission: She had acute pain in the left hip, with flexion and local heat; fluctuation was perceptible at the front of the joint. Treatment, etc.: Under chloroform the limb was straightened and extension applied. August 24th, the child was ill and haggard; there was great pain on movement or pressure upon the joint; considerable heat and lividity about the groin; limb adducted; no alteration in the length of the limb. Temperature 101·6 degrees. Refused food. August 25th, excision by anterior incision; much pus escaped from the joint; the upper epiphysis was destroyed, and there was pelvic abscess; a counter opening was made behind; operation antiseptic. On September 6th the wound was septic; there was much constitutional disturbance and much foetid discharge. September 12th, both feet and legs were œdematous, and the lower part of the abdomen was indurated; still much discharge. On 17th there was threatening gangrene of the right leg, which was livid on the 19th; the child had two epileptiform fits and was unconscious for two hours; she recovered from this, and the swelling of the legs diminished on the 24th. A slough formed on the dorsum of the right foot. Throughout October she slowly improved and the discharge diminished. During November she continued to improve; the swelling subsided; the wounds contracted; as no extension has been able to be applied both legs became flexed. She is now in fairly good condition and improving; there is still some discharge

from the sinus leading into the pelvis ; she takes her food well, but is still rather thin and feeble ; her legs have not yet been straightened. [The case was one of exceedingly acute osteitis of the femur with secondary pelvic abscess. Apparently thrombosis of the iliac vein occurred as the result of the pelvic inflammation, but there is now every prospect of her getting well, November, 1881.]

Case 18. *Hip Disease. Old Excision. Amputation. Relieved.*—Ralph D., age 6 years. Admitted 16th April, 1878 ; discharged 28th September, 1878 ; readmitted 30th May, 1881 ; discharged 27th August, 1881. History : Early in 1878 the hip was excised. Result : He was sent out with some necrosis of his pelvis ; a good deal of discharge and 3 inches shortening. Readmitted May, 1881, 3 inches shortening ; much discharge ; anæmic ; large liver ; albuminuria. Treatment : Amputation at the hip ; the femoral artery was first tied with chromic gut ; oval operation ; soft tissues much infiltrated ; a quantity of new bone formation ; pelvis diseased ; there was very little shock, and the next day he sat up and played with toys. Result : Discharged much improved, but with sinuses ; no albuminuria, and liver smaller ; was getting about on crutches. December, 1881, gets about out of doors, and can run with his crutches.

Case 19. *Hip Disease. Amputation.*—Peter H., age 7 years. Admitted July 8th, 1884. History (?) phthisical. Duration : Five years. Had scarlet fever since it began ; after the fever the hip became better until a fortnight ago, when an abscess appeared and burst yesterday. On admission, fairly healthy boy ; left hip disease ; large abscess discharging ; shortening 1 inch ; sinus enlarged. 11th, temperature 103°6. 12th, curdy pus and small sloughs removed. 17th, screams at night ; wound better. August 2nd, counter opening made into a pocket of pus at the back of the joint. 5th, on exploring the abscess cavity the whole of the front of the upper part of the femur was found bare and rough ; the margins of the acetabulum were bare, and several small loose sequestra

were found lying near the upper end of the bone ; the head of the femur was gone ; disease of femur too extensive for excision. September 30th, no visceral disease ; no albuminuria. October 3rd, amputation through hip joint after full exploration ; femoral artery ligatured first, then amputation by Furneaux Jordan's method ; very little blood lost ; acetabulum gouged ; sinuses cleared ; chloride of zinc, iodoform, etc. The upper end of the femur was much diseased, as low as $3\frac{1}{2}$ inches down the shaft ; subsequently did well. Discharged November 17th. February, 1885, still several sinuses ; condition only fair ; has some pain in stump. There is, no doubt, pelvic disease.

Case 20. *Hip Disease. Amputation.*—James L., age 5 years. Admitted Oct. 6th, 1884. History good. Duration : Two years. Fall. On admission, right hip disease ; abscess. Oct. 23rd, joint freely incised ; cartilage loose (subchondral caries). Did fairly well up to December 11th, when he was attacked by scarlet fever, and removed from the ward. February, 1885, much suppuration tracking down limb ; is doing no good ; had post-scarlatinal nephritis severely. Readmitted February 11th, 1885. After discharge from the fever ward he became much worse, the wound discharged freely, and he had a good deal of pain. On readmission he had been neglected, and there was much offensive discharge with a fresh abscess ; there were several pressure sores about him. He was fed up and the wounds washed out with perchloride of mercury till February 26th, when the hip was explored ; disease was found to spread too far down the shaft for anything short of amputation. 19th, in fair condition ; a trace of albumen in urine ; amputation at the hip by Furneaux Jordan's plan after preliminary ligation of the common femoral artery ; several large branches of the internal iliac bled freely for a moment ; the sinuses were scraped out and the wounds washed with chloride of zinc ; the acetabulum was almost entirely bare and the bone soft ; the cartilage of the head of the femur was eroded, the bone pale and mottled, with several small foci of cheesy matter scattered about ; a soft mass of granulations occu-

pied the epiphysial line, below this was another mass of cheesy matter, the disease extended for some inches down the shaft, which was bare of periosteum in front; there was some new bone round the shaft for 4 inches down, the mischief tracked down the muscles towards the knee joint, which was just beginning to be attacked, the synovial membrane pulpy, and the cartilage thinned. After the operation the boy was restless for some hours, but after opium and brandy he became quieter; subsequently there was much discharge and very little primary union of the flaps, but he got steadily well, and was sent home on April 26th with the wound all healed except one drainage opening. September 29th, 1885, almost healed; fat and well.

Case 21. *Periarticular Abscess of Hip*.—Annie P., age 11 years 11 months. Admitted April 13th, 1885; one brother has abscess in the neck; had measles at 4 years, otherwise healthy till fourteen months ago when she had a fall; nine months ago an abscess formed and was opened, after which she was better and able to walk about; a month ago the wound reopened and has been discharging since; she walks lame and complains of aching in the hip; there is no night pain. On admission, a healthy-looking girl; on the outer side of the left hip is a small sore; there is slight thickening round the trochanter; all movements of the joint are free and painless; no shortening. April 28th, hip explored; the capsule was incised and the head examined, but found healthy on the surface; the wound was drained and dressed; all went well; the tube was removed on May 12th. On the 20th the wound was superficial, and a Thomas' splint was put on; no shortening; sent home on 23rd. February 6th, 1886, all sound and well; to walk.

Case 22. *Periarticular (?) Abscess of Hip*.—John J., age 6½ years. Admitted June 23rd, 1884. Probable history of tubercle. Had scarlet fever at 2½ years, with otitis, and as a result is deaf mute; always delicate; seven days before admission fell off a chair and bruised the hip; a swelling was noticed at night; he was not laid up with it. On admission, a pale, thin, delicate boy; a large fluid

swelling on outer side of right thigh ; movements of joint free and painless ; no thickening of trochanter ; no shortening ; swelling opened, contained a large quantity of yellow serous fluid and flakes of lymph ; no bare bone ; no communication with the joint ; extension applied ; did well, but on 30th pulled off the antiseptic dressings ; after this the wound did not drain well, and a counter opening was made ; he was sent home in a Thomas' splint on July 23rd. Readmitted April 27th, 1885, the right leg and thigh are slightly flexed and adducted ; there is a good deal of thickening below, not round, the trochanter, and fluctuation (?) can be felt in front of the joint and over the gluteal region ; a sinus in front and behind ; no shortening. May 7th, exploration ; an old drainage tube was found in the sinus ; the thickening below the trochanter proved to be composed of cicatricial tissue ; no bare bone ; did well ; sent out on 23rd. March 23rd, 1886, a superficial scab ; walks on the leg without any support ; all well.

Case 23. *Hysterical Hip*.—Sarah B., age 15 years. Admitted November 21st, 1885. A poorly-fed and neglected workhouse child. Three weeks ago began to complain of pain in the right knee ; the pain was continuous night and day, and was thought to be rheumatism ; it was increased on going up and down stairs. A week later a swelling was noticed on the inner side of the knee ; ten days ago began to have a pain in the hip, which increased and was very severe for three days ; for a few nights used to wake up screaming ; the swelling of the knee had decreased a few days before admission. On admission the pain is somewhat better, but any slight pressure, such as putting on a stocking, is painful. Some of the above symptoms were given as the result of leading questions. Examined on the 22nd ; a very neurotic looking girl ; complains of pain over the lower and inner part of the thigh when either the knee or hip is moved ; movements of both joints quite free ; no increased heat or swelling ; no muscular wasting or abnormal appearance about hip, knee, or spine. On getting out of bed and being told to

walk quickly, limps much and seems in great pain. Was told she would be quite well in a week ; ordered abundant food, and to get up and walk about the ward. 25th, quite well ; walks without limp, and is bright and happy looking ; has no pain, and wants to go back to her place in service.

Case 24. "*Acute Suppurative Arthritis of Infants.*" *Excision. Cure.*—Martha Jane R., age 1 year 1 month. Admitted October 1st, 1880. Family history good. No injury. Never walked. Duration, etc.: Two months ago had measles. One month ago had pain and swelling in knee, extending to the hip. Fourteen days ago was hot and feverish, vomiting, and crying. Condition on admission: Anæmic ; extreme swelling round right hip, reaching up the buttock and into the groin and lower part of the abdomen ; abscess ; joint flexed. Treatment: Incision on October 7th, antiseptically ; head of bone felt rough and disorganised ; carboloria and collapse followed ; dressings were soiled and became septic. On 17th, doing well, but still much discharge ; infra-trochanteric excision of head of bone, which was represented by a minute carious button of bone covered with granulations ; acetabulum healthy. Result: December 8th, wound healed ; barely $\frac{1}{2}$ inch shortening ; power over limb fairly good and improving. May, 1881, wound quite healed ; sometimes seems to have a little pain, and does not use it as freely as the other ; no sign of disease.

Case 25. "*Acute Suppurative Arthritis of Infants.*" *Pyæmia. Death.*—Anna B., age 19 days. Admitted November 5th, 1880. Died December 8th. Duration of disease: A "cross birth," attended by a midwife who "helped." Has had vomiting and pain for the last day or two. Condition on admission: Right *shoulder* surrounded by a large fluctuating swelling. Treatment: November 6th, abscess opened antiseptically ; no opening found in joint capsule, abscess beneath deltoid. 16th, abscess almost healed. 17th, a swelling over right parotid. 18th, abscess over lower part of sacrum, temperature 101·6 degrees. 19th, a large abscess round *left hip* and thigh, whole leg

oedematous; no grating; parotid abscess opened. 20th, hip abscess opened. December 4th, abscess of hip refilling, not doing well. Explored, joint found disorganised, upper end of femur cut off with a scalpel. No trace of a head left, a pit in the trochanter with a few bony granules in it representing head and neck. Some carboluria. Result, sank and died.—P.M.: Acetabular cartilage soft but not destroyed. Multiple cutaneous pyæmic abscesses. Upper end of femur had a slight amount of new bone thrown out. Right shoulder completely destroyed, head of humerus gone. Wound of shoulder healed, no pus in it. Parotid abscess healed. Sacral abscess communicated with several sacral joints. Some lymph on the surface of the spleen. Two abscesses in the liver, one in the kidney, many in the lungs with pneumonia.

Case 26. "*Acute Suppurative Arthritis of Infants.*" *Excision. Death.*—Mary F., age 6½ months. Admitted March 25th, 1881; died March 30th, 1881. Duration of disease: Well till six weeks ago, then pain and swelling appeared in left knee and later in hip. Condition on admission: Anæmic; left leg altogether swollen, with fluctuation from the crest of ilium to buttock and down to middle of thigh; veins turgid. Treatment: Incision; no communication with joint made out, but considering the nature of the case joint was opened; head of bone entirely gone down to trochanter; surface shaved off with a scalpel; antiseptic. Result: Sank and died on 30th. No P.M. allowed.

Case 27. *Acute Suppurative Arthritis of Hip.*—Alfred W., age 9 months. Admitted May 3rd, 1884. History good. Never very strong; no known cause; swelling about hip one month ago, On admission, pale but not thin; abscess round right hip; grating felt in joint; incision; head of bone gone. 5th, takes food well; much discharge; temperature subnormal. Did moderately, but on 15th still looked pale and ill; sent home on 24th with wound superficial. Subsequently, fresh suppuration occurred, but after a hard struggle the limb became sound and well, with good mobility and little shortening.

Case 28. *Acute Suppurative Arthritis of Hip*.—Samuel C., age 9 months. History good. No cause. Duration: One month. On admission, March 15th, 1884, pale and anæmic; large abscess round left hip; abscess opened by House Surgeon on admission; no communication with joint made out; no grating. 17th, re-explored; much pus escaped; head of bone gone; no reaction in wound; child did fairly well for a time, but showed no signs of repair, and finally sank and died April 9th.—P.M.: Only joint examined; much thickening all around hip joint with sup-puration, an opening at upper part of joint; joint surfaces completely destroyed, and head of bone gone, only a stump of neck remaining; surface of acetabulum covered over with granulation tissue.

Case 29. *Acute Suppurative Arthritis of Hip*.—John H. G., age 8 months. Admitted June 28th, 1884. History good. Never well since hooping cough at four months and chicken-pox six weeks ago; swelling about hip noticed three or four weeks ago; got worse since. On admission, thin, anæmic child; very fretful; rickety; rhonchi over both lungs; large abscess round left hip; abscess opened antiseptically; small opening could be felt in joint; head bare. July 2nd, wound shows no signs of repair; temperature subnormal; takes food badly. 5th, child fretful, but takes food better. 8th, temperature 101·2 degrees. 10th, very sick during night; died about 9 a.m.

Case 30. *Acute Suppurative Arthritis of Hip*.—Nicholas L., age 7 months. Admitted July 16th, 1883. Family history good. Previous history: Always healthy till he got hooping cough four or five weeks ago; swelling noticed over Poupart's ligament one week ago, then the whole thigh swelled; pain on movement; has lost flesh. On admission, abscess in thigh opened; 2 oz. of healthy pus escaped, then some grumous matter; head of femur nearly gone; rough stump left; floor of acetabulum rough and eroded; not antiseptic. The child did fairly well, and was sent out on August 26th with wound not healed. Temperature on admission, 99·2 degrees; ranged up and down between sub-

normal (about 97) and 101, occasionally higher, sometimes as low as 96.

Case 31. *Acute Suppurative Arthritis of Hip and Knee.* Chas. W. B., age 1 year 11 months. Admitted December 9th, 1882. Family history: Is one of nine; eldest has enlarged cervical glands; two died of convulsions (teething); one of thrush; one of wasting at 6 weeks. Previous history: Never healthy; brought up on bottle. Present illness: Three months ago began to drag the left leg; six weeks ago an abscess was first noticed; from the first has had pain on movement. On admission, wasted; anæmic; a large abscess distended nearly the whole of the right thigh, which lay helpless and everted. Shortly after admission the abscess was opened antiseptically; the cavity led readily into the hip joint; acetabulum full of soft granulations; the top of the femur was shaved off; the head was almost gone. December 11th, has had to be dressed several times; knee is now full of fluid; takes food well. 14th, wound septic; knee less swollen. 16th, knee joint opened; full of sanious pus. 19th, petechial rash over lower part of abdomen; much discharge; bowels relaxed. 27th, losing ground; less discharge. January 10th, been sinking, though takes food well; still purged; died; temperature throughout ranging up to 102·8, and falling frequently to subnormal; on January 8th nearly to 95 degrees.—P.M.: Acetabulum full of granulations; upper end of femur smooth and rounded off; knee contains pus; cartilage eroded, apparently involved by extension from thigh; no further examination was made.

These are good instances of "Acute Suppurative Arthritis of Infants," except that the last case is older than usual, and the implication of the knee by direct extension is less common than as a pyæmic condition.

For case 4 I am indebted to the kindness of Mr. Lund; for cases 3 and 13 to Mr. Heath; for cases 7, 8, 9, 14, 15, 16, 17 to Mr. Thomas Jones, my colleagues, at the Manchester Royal Infirmary.

NOTE.—I have had an opportunity, too late for insertion in its proper place, of seeing a case of diastasis of the upper epiphysis of the femur. A subject in the dissecting-room of the Owens College, aged about 40, was found to have on the left side complete separation of the epiphysis; there was a false joint between the head and neck lined by a smooth membrane, there was considerable mobility, little distortion of the bony surfaces, and the ligamentum teres was intact. There was no history of the case known, but no evidence of rheumatoid arthritis was found, and there appears to be no doubt that it was truly a case of diastasis, and as such I believe unique. For an opportunity of seeing the specimen, I am indebted to my friend Prof. Young.

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